

AMATEUR EQUIPMENT

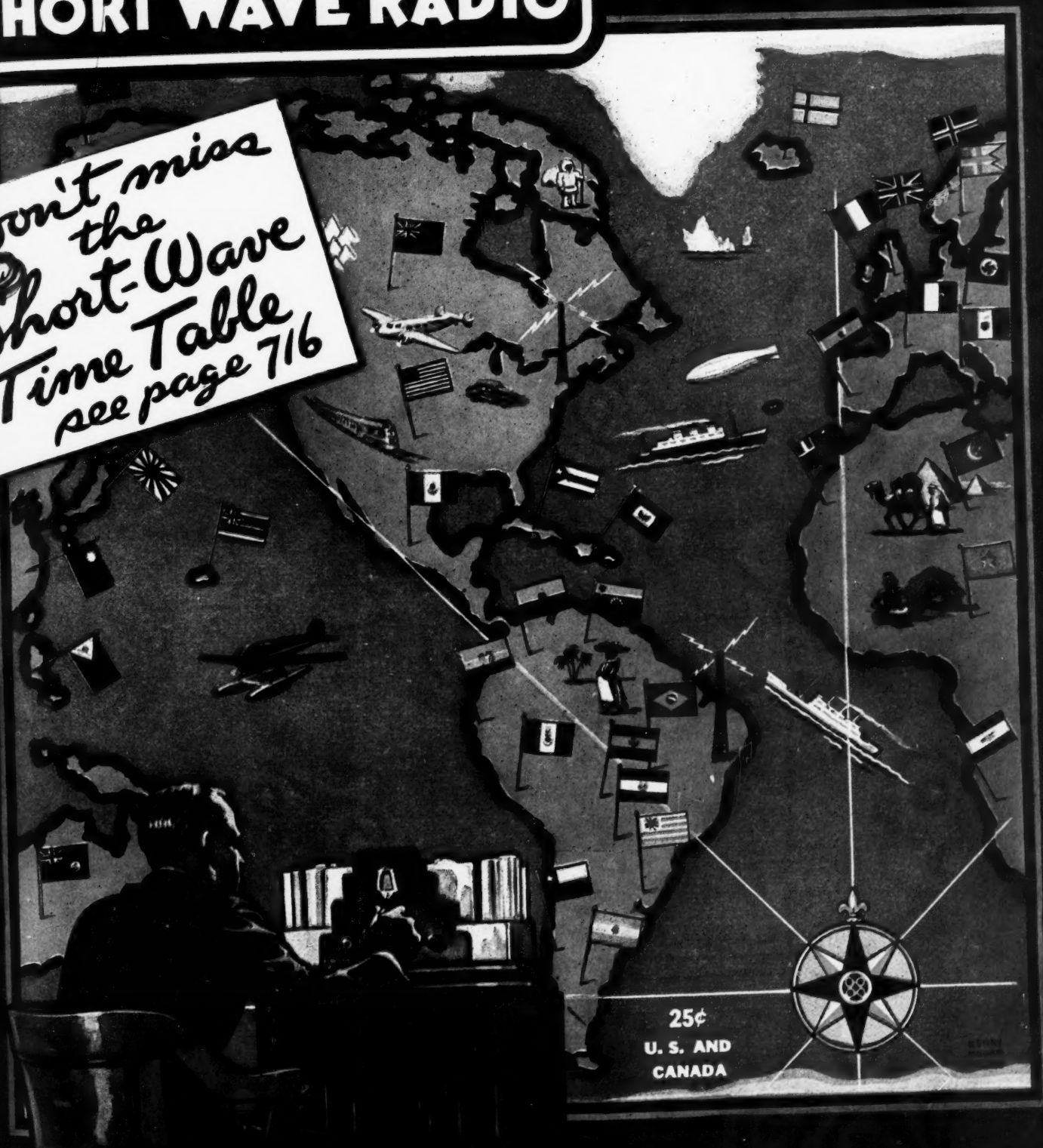
RADIO NEWS

AND

SHORT WAVE RADIO

MAY 4 - 1950
**SPECIAL
SHORT-WAVE
NUMBER**

*Don't miss
the
Short-Wave
Time Table
see page 716*



25¢
U. S. AND
CANADA

ONCE AGAIN ***We Thank You!***

THIS issue marks the 17th Anniversary of RADIO NEWS—radio's oldest semi-technical publication. And we, the staff of RADIO NEWS, wish to extend to you, our readers and advertisers, our sincere thanks for your valued patronage which has made this long life possible.

EVER since 1919—a year before regular broadcasting began—when a crystal receiver that brought in a few, weak, nearby stations amidst the roar of static was something to brag about—RADIO NEWS has been the alert observer for tens of thousands of radio men—accurately reporting and describing each new development in the saga of radio progress.

NOW, we stand at the threshold of a new era—the age of television. And again, RADIO NEWS stands prepared to bring you each new development as it springs into being. You may rest assured that so long as the fertile minds of radio experts create new radio devices and theories, RADIO NEWS will report them to you accurately and concisely.

WE consider it a solemn trust to ever aid in the advancement of radio. The past has proven the value of this—many of our readers who were “beginners” 17 years ago are now leaders of the radio industry.

AT this, the beginning of our 18th year, we again pledge to continue our editorial policy of publishing all the important news of every branch of radio—in the same friendly, factual manner as we have always done.

WE like to think of RADIO NEWS not as a commercial proposition but as the “eyes and ears” for our many radio friends. It is *your* publication—without your constant patronage it could not exist. Help us make it even more valuable—by telling your friends and neighbors about the features you like. Only thru this cooperative spirit can we continue to advance—for you, our radio friends, are the backbone of this publication.

Radio News

MADMAN'S MARATHON! through the streets of Diepte — get it direct from France — with a SCOTT!



FROM ALL THE WORLD—

Crowds line the streets—lean from the windows—laughing—excited. Thrill of the year for seacoast Diepte!

You hear the throbbing roar of the racers long before you see them. But here they come! One—two—four—ten—twelve! Frenchmen at a madman's pace—roaring toward us down the crooked crowded streets! Skidding around corners, bumping curbs—missing the crowd by inches—brakes screaming, goggles gleaming—madman's marathon! Car out of control! Look out!—he's going to crash!—Wait—he's straightened out again. Shrieking tires—as the mad pack dodge past him with a deafening roar and rush. Mile after mile this flirting with death—thrills, spills, chills!

The skill and daring of these flying Frenchmen send the blood charging through your veins! Time was when all sporting France flocked to Diepte for this historic yearly event, run through the city itself where the streets are lined with people risking their lives to watch it. Now it's broadcast over all the world—more daring, more hair-raising than even our own Indianapolis Speedway classic.

If you aren't going to France this summer the next best thing is to hear this famous race in your own home—with a SCOTT—direct from T P A Colonial France!

The celebrated custom built SCOTT has made world adventurers of thousands of amateur radio enthusiasts, DX fans, broadcasters, radio stars, famous musicians and Princes and Presidents in more than 146 countries. They have all found the world a



SCOTT 23 tube Full Range Hi-Fidelity Radio with the Laureate Grand Console

more fascinating and friendly place to live because of the astonishingly brilliant worldwide reception the SCOTT gives.

RECORDS GALORE

Owners in U.S.A. alone logged in detail 19,257 programs from 320 foreign stations in a short six months time. Here is a fragment of C. H. Weyrich's list. 4BH and 4BC (both 600 Watts) and 2BL in Australia; KGU and KGMB (250 Watts) Hawaii—all with verifications (see SCOTT News April, 1935, P. 10).

CIRCLE THE WORLD

Argentine—Java—Spain—Germany—England and dozens more! So dependable

INTO YOUR OWN HOME

is SCOTT foreign reception that SCOTT receivers are now being installed in leading American universities to aid students in the study of foreign languages.

Years of planning and research have put the SCOTT years ahead. The SCOTT is, we believe, the only receiver today with a high fidelity overtone range provably 30 to 16,000 cycles. You miss the full beauty of programs if your radio misses those vibrant ringing overtones which alone enable the human ear to distinguish one instrument from another. The SCOTT today gives you domestic programs with pre-microphonic tone truth—achieved with the new exclusive SCOTT Volume Range Expander.

YOU ARE INVITED

to compare the SCOTT on a 30-day trial in your own home anywhere in the United States. Nationwide installation. Five year guarantee. Strictly custombuilt to the highest known precision standards. Send today for the illustrated booklet, "PROOF OF CONSISTENT FOREIGN RECEPTION"—one of the most astounding records of world-wide performance in all radio!

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RADIO NEWS

Vol. XVII June, 1936

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No. 12

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Coming— Next Month

The July issue will be a special Vacuum Tube number with "dope" on new tubes, tube charts including all types and makes, etc. For the summer broadcast fan there will be a "How to Build" article on a truly portable a.c.-d.c. superhet with built-in antenna. A swell 5-meter "M.O.P.A." rig will be presented with full construction details for the amateur. A little 1-tube amplifier to be added to the 1-tube receiver described in the beginner's series this month will be described in detail. Plus a number of other features for the serviceman, the s.w. fan and the technician.

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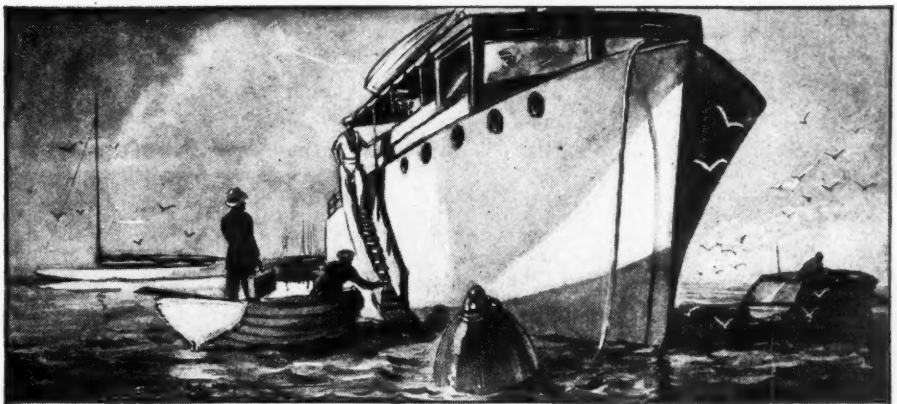
Pages From A Serviceman's DIARY

FRIDAY—Loaded up for a trip to the yacht harbor, one of our customers suddenly having discovered that the radio on his yacht wasn't working. Had to take along everything to do the job on the spot, since the guests would arrive in the afternoon, all set for a three weeks' cruise. Thought it well to fortify myself with a replacement set just in case I might not have the one part necessary. Arrived at the harbor to find a mechanic struggling with the club launch motor which would turn over two or three times, then "cough" and stop. Finally gave it up, after several attempts, and we loaded everything in a rowboat and set our bearings for the yacht, about a half mile offshore. Pulled alongside in due time, a handsome 80-footer, and the crew gave me a hand in unloading my stuff.

Defective Vibrator

Got to work without delay, putting the soldering iron on the oil-stove flame so as to have it ready. Found the receiver mounted in the most inaccessible place (which owners always select even though we warn them service charges will be high if the set has to be worked on). This was an RCA M-34 auto-radio and the action of moisture on the mounting bolt had caused it to rust the nut firmly in position. Bathed the bolt well with penetrating oil and let it soak while I checked the installation, which proved O.K. Finally loosened the nut and got the set off. (Defective vibrator, as I had expected with such an early model, so installed a replacement). Set now operated but had a bad speaker rattle. Found it couldn't be centered; apparently the cone coil had become warped. Removed the cone from my replacement chassis and installed it. Reconnected everything and finished the installation work, which was some difficult job to avoid scratching the cabin woodwork. Went aft to get the skipper, who was busy shaving, and he invited me for lunch. The skipper showed me how he makes a razor blade last a long time by rotating it around the inside of a tumbler, pressing the edges firmly against the glass. After looking at his chopped-up visage, though, I mentally decided that it might be better to economize in some other manner. Had a swell meal, then went on deck, both of us speculating as to whether the club launch was now operating okay

THESE records from an anonymous serviceman's diary should be of decided interest to veteran servicemen, as well as to those whose experience in the service field is more limited. Written by a man who "knows his stuff," and shot with an occasional outcropping of humor, these items provide many hints not found in text books. More of these pages will appear from time to time.



YES! "THAR'S MONEY IN THEM THAR WATERS"

Servicemen located along the seacoasts, rivers and great lakes can render an excellent service to the yachting fraternity if they will specialize during the summer months on installing and repairing radio equipment for boats of all kinds. The problem is usually a special one as each installation needs individual consideration. Radio "on board" certainly offers definite advantages of safety and entertainment in cruising and a profitable line for wide-awake servicemen

or not. Blew a horn several times to signal the clubhouse, ran a special flag up the mast so they could tell which yacht was calling, then waited. What a poor system of communication! Why can't yachts install simple 5-meter phone transmitters and receivers so they can maintain two-way communication with the club or with other yachts? Getting a license for transmitting is certainly no more difficult than obtaining one for operating an automobile. Even 12-year-old children have passed government tests. (Made a mental note to talk over with the boss some way of starting an educational drive on this subject.) However, the club launch finally arrived and I loaded up again for the trip back to shore, a tough job completed.

Stopped off at the clubhouse to fix a Stromberg 642. Complaint—could get only one station! Such trouble sounds serious but requires nothing more than a screw driver to fix. Removed the chassis, found the dial drive was not turning the gang-condenser shaft, tightened the dial set screws, checked the calibration and job was done. Since meals were usually served on the terrace, weather permitting, suggested the installation of an automatic record-changer and P.A. amplifier, the speakers to be located outside the clubhouse. Made arrangements for a temporary installation subject to the approval of the club committee. Picked up another service call from one of the members and moved on.

Spring Is Here!

Turned off the main highway for a long jaunt into the "sticks." Drove slowly, looking for landmarks and reading names on the mail boxes on posts along the road. After a five-mile run without locating my party, pulled over alongside a driveway and called over to a gardener for directions. He answered in such broken English that I couldn't understand him. Was about to give up when a second-story window flew open and a charming blonde head popped out! This lovely lady put me straight in a hurry—the place I sought was only a short distance farther on. "This man understands women," she called out to the gardener, waving a handkerchief as I started off again, feeling as I imagine Stonewall Jackson might have felt if Barbara Frietchie had been a little younger. (Thank goodness I'm in the radio business—I'll have an excuse to make a free inspection call at that place.)

Arrived at last. A large, brick house set well back from the road and surrounded with landscaped gardens. Three sets—same complaint on all—noise! Obviously only horse sense required here. Learned an electric heating pad was being used by an invalid on the second floor. Had the pad disconnected and located trouble in the thermostat. Will have to be replaced. Still more trouble, however, particularly noticeable on a set in the servants' quarters. Found a laundress at work, checked over the electric iron and found the contact points badly pitted. Replaced plug and cleaned points. (All O.K. now.)

On the way back, stopped off at the blonde young lady's home, thanking her again for her help in directing me and offering to check over the radio without charge. "It is really operating very well and we are able to take care of it ourselves, thank you," she said. Seeing I was somewhat taken aback, she asked me to come in and judge for myself. Followed her upstairs to the top floor, meanwhile reminding her that radios were complicated instruments which should not be handled by inexperienced persons. She agreed without further discussion and opened the door of a room at the rear of the house. Got another shock when I saw a beautifully laid-out rack-and-panel transmitter, with two receivers on an operator's table and the walls covered with QSL cards from all over the world. Looked out the back window and saw two 50-foot steel masts supporting horizontal antenna and a vertical half-wave 5-meter antenna fastened to the side of the house. "Guess the joke is on me," I said. "I've heard of expert YL operators, but this is the first time I've had the pleasure of meeting one." She added, "Many more thousands would go in for short-wave radio if more servicemen were available to fall back on when the apparatus failed to perk." She and her brother were both licensed amateurs and had done much of the construction work themselves. Then proceeded to demonstrate her own skill, shooting off a CQ at 35 w.p.m. on i.c.w., using a submarine bug. Established contact with a "K4" in Porto Rico, switched over to phone and then to duplex operation with amazing smoothness. Rattled off a description of the apparatus, which included automatic carrier-level control, cathode-ray, modulation-percentage indicator, frequency meter, monitor, and what not. Noticed a 20-inch vector slide-rule on the table. This girl obviously preferred a slipstick to a lipstick.



Millions of MALLORY Condensers
Millions of MALLORY Vibrators
Millions of YAXLEY Volume Controls
Millions of YAXLEY All-Wave Switches

**Millions of these precision-engineered
parts have built a huge market for you**

Mallory pioneered the dry electrolytic condenser—and developed it to its present tremendously efficient form of universal application. Mallory engineering was definitely responsible for the development of the vibrator that made the all-electric automobile radio set a practical achievement. Yaxley Volume Controls and All-Wave Switches repeatedly have set new standards of performance. Mallory-Yaxley engineering has steadily worked towards universal application of radio parts so that—

... there has been created for you a vast replacement market which is wide open for intelligent servicing by men who keep abreast with the development of precision replacement parts for universal application.

And Mallory-Yaxley leadership provides that universal application with Mallory-Yaxley Replacement Products that serve the *entire* field efficiently and with astounding precision.

MALLORY

YAXLEY

Radio News

June, 1936

Some DX HINTS

(for the Beginner)

So many new listeners are being introduced to short-wave reception, via a new all-wave radio receiver, persons who have little idea of the problems of reception on these bands, that this article of timely hints should be of first importance in many a household

THESE tips are aimed at the newcomer to the DX pastime, with the hope that all of them

may be helpful to some—and some of them helpful to all. They have been gleaned from experience, reading, and at times even a mild flurry of thinking. An effort will be made to pack the meat of these varied researches into one article, making a ready reference for the tyro in the DX sport who does not wish to wade through one or several years' copies of the magazine in order to find this or that item of needed information.

First, let us consider several pointers which apply to short-wave listening (and, incidentally, to long-wave DX too). The importance of an appropriate aerial is always plainly stressed and often rightly so. It is largely a matter of location—dependent on how much (or how little, if you are in a fortune spot) unwanted aerial matter there may be near your receiver, such as power lines, trolley wires or steel buildings. Such metal masses will rob the incoming signal of a portion of its strength. Hence your aerial must be efficient to counteract those losses.

Time Differences

In attempting very distant or transoceanic reception, consideration must be given to differences in time. Thus, when it is noon (Standard Time) in New York City,

By William H. Fraser

it is 9 a.m. in Los Angeles, 5 p.m. in Daventry and London, 6 p.m. in Berlin and Rome, 5:30 a.m. in Honolulu,

and (the following morning) 1 a.m. in Shanghai, 2 a.m. in Tokyo, and 4:30 a.m. in New Zealand. The general rule is that places, 15 degrees of longitude apart, vary one hour in time.

Here is one way of reporting for a QSL (verification card or letter) which has usually brought courteous and generally prompt answer. First, be sure of what you have heard. Don't rush off a glowing letter to German or French stations after catching an odd word or two in their respective languages, and making a hopeful stab at guessing the wavelength!

Remember there are certain broadcasts from transmitters on this side of the pond offered in various foreign tongues which you might mistake for foreign transmissions.

List these facts in your report asking verification:

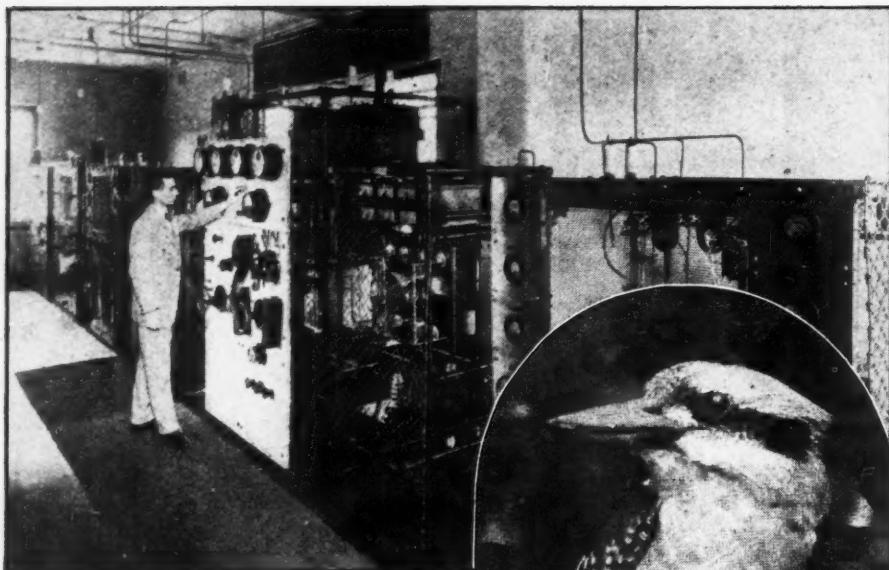
- Call letters, place name, or identifying sound used.
- Approximate frequency or wavelength.
- The date.
- The time (reduced to that of the transmitter's locality).
- Names of at least two musical selections heard (or the equivalent of an address, news-cast, etc.)
- Your airline DX in miles from the station.
- Local weather conditions.
- Quality of reception: (1) Clarity, (2) Volume, (3) Fading.
- Type of receiver and aerial (if any).
- DX Club membership, or connection with radio work.

Naturally, you will express pleasure or a word of thanks for the entertainment. Return postage increases your

THE THRILL OF A LIFETIME—DX!

Everyone remembers the amazement and pleasure that he experienced with his first DX (long distance) reception, and the short waves will give you plenty of that at any time you listen in if you understand when to listen and how to tune





HEARD AUSTRALIA YET?

The 20 kw. short-wave transmitter, VK2ME, situated at Radio Center, Pennant Hills, Sydney, Australia, is one that all listeners the world over can hear regularly. It can be recognized during announcements by the call of the "laughing jackass," which, by the way, is a bird and not the four-footed, stubborn variety of mammal



chances of bagging the desired card—but your national postage stamp or coin is of no value in foreign lands. Buy P.O. Reply Coupons, or you can buy all types of foreign stamps from The Stamp Window, Ltd., P.O. Box 237, Geraldine, Montana.

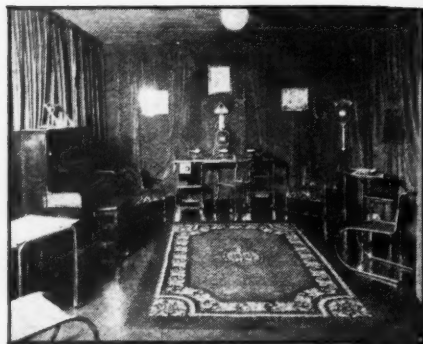
Influence of Weather

A dark room is the best for big DX, as it seems to sharpen the sense of hearing. In this connection, some listeners have a separate switch for the dial light. Or, as a desk lamp, one or two of the 2-watt neon glow lights (they fit the standard 110-volt house-lighting socket) provide the ideal illumination for making notes in the log—no glare or waste of power.

Some stations will forward (for postage) an advance monthly schedule of

their broadcast activities.

Weather is often the bane of the serious DX hunter, yet at times even its vagaries can be put to worthwhile use. On the short-waves, the coming season of warm weather will bring the best results, especially on the 16-meter, 19, 25 and 31-meter bands. Sometimes damp cloudy days are wonderful for S.W. DX. Or, if you wish to listen to the overseas stations on the long waves, the best results will follow attempts made during the cold seasons. On such transmissions, the most likely hours are naturally those



A REGULAR STANDBY

This is the studio of the powerful station EAQ at Madrid, Spain, a favorite short-wave broadcaster for many years

when the signal path is dark.

A general rule as to DX efforts during what seems to be poor radio weather, might be one advising the listener to stick to the short waves at such times—more particularly, frequencies above 7000 kc. Yet here, as in most things, the exception sometimes proves the rule.

Good air conditions for big DX often appear to lie in directional strips across the world. Thus a listener near the Great Lakes may experience a night when he can log most of the European stations yet be unable to hear anything of value from Asia or Australia. Another night the reverse may hold true.

Antennas and Grounds

Some receivers perform better, in the case of signals coming (for the major portion of their travel) across a large body of water, using no ground connection. In other cases, reception has been improved (static noticeably lessened) by disconnecting the usual aerial, and changing the ground wire to the antenna post. Go ahead and experiment! Almost anything is worth a trial—save perhaps such carefree gestures as applying "B" (plate) voltages to the tube filaments. . . . Even the long-bearded experts in this wireless game will at times admit there are a few things yet to be learned.

One of the best DX grounds can be easily made, as follows: a coil of wire, anything from 18 to (Turn to page 753)

LISTENING TO THE HOME COUNTRIES

At almost any time, day and night, you can hear the British Empire broadcasts and the German broadcasts on short waves. At left: The B.B.C. studios in London, programs of which are heard on the "G" stations. Below: The German broadcast center, whose programs are on the "D" stations



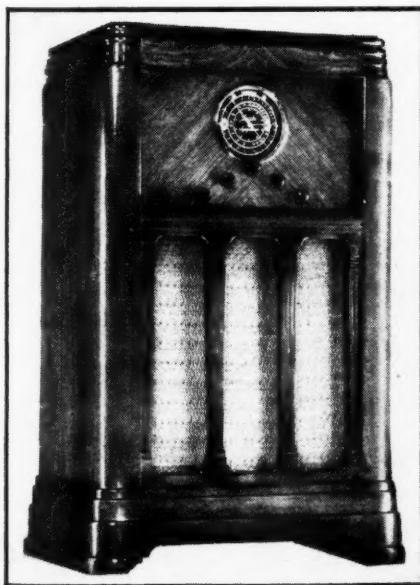
WHAT'S NEW in RADIO

Short-wave listeners and servicemen want to know about the latest receivers now being offered, including the latest types of accessory equipment

By W. C. Dorf

Receiver to Provide True Tone Quality

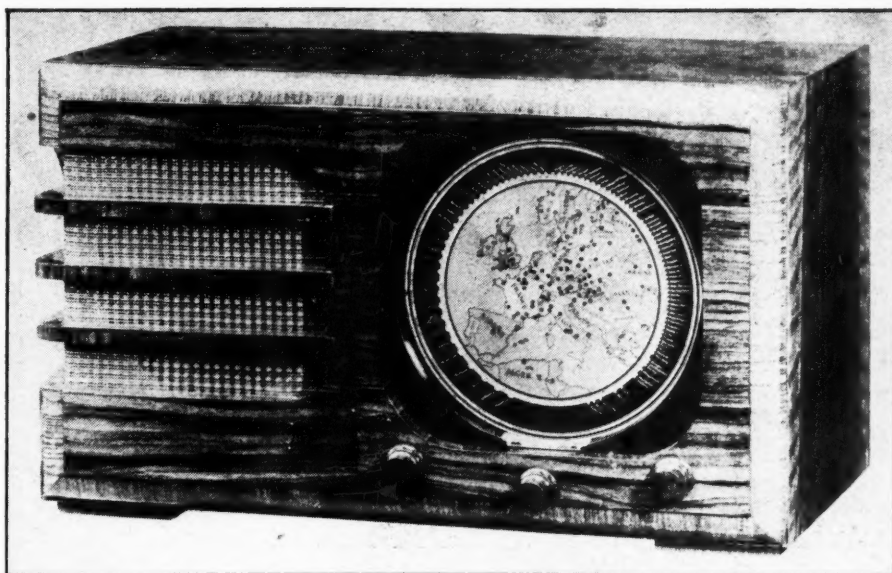
The Lincoln "Symphonic" 20-tube super-heterodyne all-wave set shown in the accompanying photograph is housed in a cabinet of special design featuring the Lincoln "Free Floating Speaker Resonator" designed to eliminate all mechanical paths of vibrations to the cabinet and chassis.



This is a separate assembly on which the speakers are mounted and completely insulated from the cabinet.

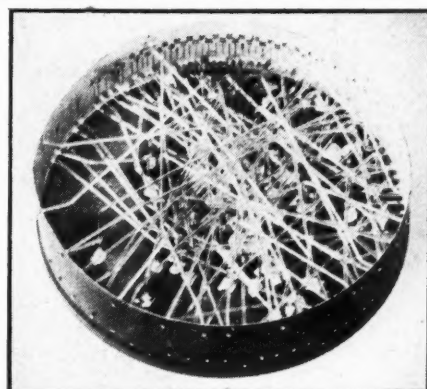
An Attractive Four-Band All-Wave Receiver

Several design features are incorporated in the new General Electric table model A-82 receiver, of which perhaps the most important are the slide-rule tuning-scale, noise control, automatic "Lo-Note" compensation, metal type tubes in all stages and a highly efficient mechanical and electrical waveband switching mechanism. The



NEW RECEIVER TELLS YOU WHERE SIGNALS COME FROM

The receiver pictured above shows, by luminous dots on a map, where the station you are receiving is located and at the same time lights up the proper spot on the dial calibration around the outside of the circle. This is accomplished by connecting the two points on the dial with special glass or quartz tubes which will energize with light as the tuning control is turned. As each station is tuned in these two spots are illuminated. The somewhat complicated-looking network of glass on the back of the dial is shown at the right



set has dual-ratio tuning and air-dielectric trimmer condensers. The tube equipment comprises one 6K7 for the r.f. stage, a 6A8 as a combined first detector and oscillator, one 6K7 for the i.f. stage, one 6H6 for the second detector and a.v.c. control tube,

IV-A" receiver is made in two units, the tuner shown here, and a three-tube power amplifier. All told, 14 tubes are employed. A set of this type will be of interest to both the short-wave and broadcast listener because of its wavelength range of 9.4 to 2150 meters covered in five bands, its two pre-selector stages with two 6K7 tubes, a 4½-inch airplane type dial with dual-ratio tuning, a visual tuning indicator and a special 12-inch concert loudspeaker to cover a wide frequency range for high-fidelity reproduction.

Amateur Receiver

The National HRO Junior" communication type receiver utilizes the same type tubes and incorporates all the advanced features of the HRO Senior model, except the tuning meter, crystal filter and the extreme electrical band-spread. It is a 9-tube superheterodyne, has two r.f. pre-selector stages, air-tuned i.f.'s, c.w. beat oscillator and worm-drive precision condenser with large micrometer dial that has proven so popular among the amateurs.

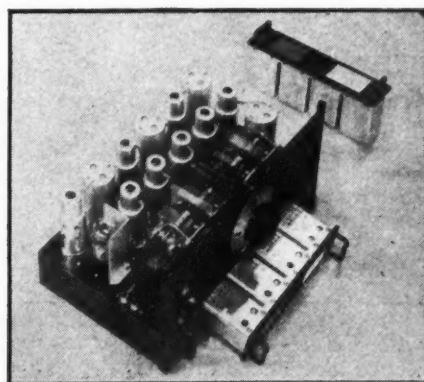
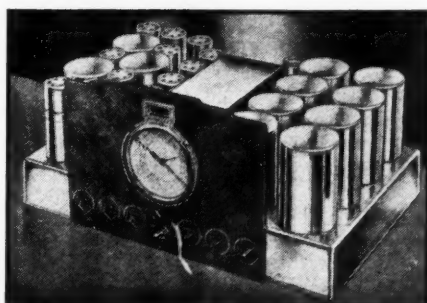
(Turn to page 754)



one 6C5 as a first audio, two 6F6's in the power output stage and a 5Z4 as a rectifier.

Custom-Built Receiver

The McMurdo Silver Corp. "Masterpiece





"RADIO-NATIONS"

(League of Nations Stations)

By R. H. Tomlinson

RADIO-NATIONS came into being during 1929. In September of that year the Assembly of the League of Nations decided to construct a wireless station for the purpose of conducting independent and direct communication between the League and the greatest possible number of its members.

THE utility of placing a means of direct communication by Radio at the disposal of the League of Nations, an international organization responsible for safeguarding and maintaining peace, had been demonstrated in a particularly striking manner in October, 1925, on the occasion of a dispute which nearly led to war between Bulgaria and Greece. Shots were being fired on both sides of the frontier and troops were mobilized. The Council of the League of Nations was informed of the gravity of the situation by a radiotelegraphic communication. On the proposal of M. Briand, at that time President of the Council, it was decided to send the Governments an appeal adjuring them not to break the peace. These telegrams which had to be sent by the ordinary route, through different countries and different telegraphic administrations, were delayed in transmission. Later, after the successful issue of the steps taken by M. Briand, it was learned that the telegrams had arrived only half an hour before the time fixed for launching an offensive. If the telegrams had been delayed another half hour, the general staffs would have been unable to give orders to stop operations.

This dramatic experience provided convincing proof of the necessity of establishing direct means of communication between the League of Nations and every country. The 1925 Assembly selected the plan submitted by the Swiss

Government, under which the League of Nations was to pay for the two short-wave transmitters intended for extra-European traffic, and the Radio Suisse, an incorporated wireless telephone and telegraphy company, provided a medium wave transmitter with a power of 50 kw. in the aerial, for European traffic, a certain number of receivers, the necessary ground and buildings required to shelter the transmitting and receiving station and the technical equipment of a central operating office.

Opened in 1932

The station bears the name of "Radio-Nations." It cost approximately 4,000,000 francs, of which 2,400,000 francs were defrayed by the League and over 1,500,000 francs by the Societe Radio-Suisse. On February 2nd, 1932, the date of the opening of the Disarmament Conference, the new station put into service the short-wave transmitters for use for trans-atlantic correspondence. The medium-wave transmitter had already been in operation since 1929 for European communications.

In normal times the station provides for the exchange (direct or by relays), of telegraphic correspondence between the League Secretariat and the delegations at Geneva on the one hand, and the greatest possible number of Governments outside Europe on the other. It may also be utilized for the transmission of the circular telegrams which the Secretariat of the League of Nations sends to the States Members of the League, and for the rapid transmission of important documents to very distant countries. It facilitates communication between the seat of the League of Nations and the States outside Europe and also provides by means of broad-

HEARD AROUND THE WORLD

The towers and transmitter house of "Radio-Nations," the international station of the League of Nations at Prangins, Switzerland, a short distance from Geneva

casting, for close contact between the work of the League and world public opinion. Lastly, the station is also utilized for Swiss commercial traffic.

In time of emergency the first of the tasks which the station has to fulfill, is to place the League Secretariat in immediate and constant touch, without the intervention of an intermediary, with the countries threatened with a conflict. The League thus enjoys for its telegraphic traffic an independence equal to that which national stations give to the Governments of the countries to which they belong.

The Station Layout

The Radio-Nations Station consists of four parts, namely: 1. Transmitting station situated at Prangins, near Nyon, about 20 km. from Geneva; 2. Receiving station situated at Colovrex, about 8 km. from Geneva; 3. Central office at Geneva in the Federal Telegraph and Telephone building, in Rue Du Stand, and fourth, the Central Control Office combined with a wireless telephony studio in the League Secretariat building.

The technical conditions of the stations are as follows: The transmitting station consists of two short-wave transmitters permitting of high-speed telegraphic or telephonic transmission. The power of each of the transmitters is 20 kw. One was constructed by the Marconi Company. This transmitter is able to work on wavelengths between 14 and 100 meters. The second was constructed by the Societe Francaise Radio-electricite and can work on wavelengths between 14 and 40 meters.

All the continents of the world may be reached by means of a group of directed aerials. Tests have shown that it is possible to obtain direct telephonic communications with the most distant countries, such as Japan, China and both Americas. From a mechanical point of view, Radio-Nations has been made entirely automatic, so that two or three persons are sufficient to work it. A large heavy oil tank and a reserve installation would make it possible, in time of emergency, to work for two months independently of the Swiss electric system.

The Receivers Employed

The receiving station uses two high speed telegraphic receivers permitting reception up to 200 words per minute, one special receiver used for telephonic communication and a number of different receivers for listening in, so that it is possible to listen to all wavelengths from 10 to 30,000 meters. The receiving aerials consist of a group similar to that used for transmitting and permits reception from every continent.

Since Radio-Nations was put in service in 1932, it has been utilized in several different ways. It was used in keeping direct touch with the League Commission of (Turn to page 765)



LISTENER'S POST IN CURACAO
Johan P. Curiel of Curacao, Dutch West Indies, sends greetings to fellow short-wave fans. He has logged stations from every continent

As a feature of this special short-wave number the 39th installment of the DX Corner for Short Waves contains an enlarged World's Short-Wave Time-Table for 24-hour use all over the world.

Welcome to Our Organization

The following new Listening Post Observers have been appointed for 1936:

IN THE UNITED STATES

Arkansas: Chester A. Joerger.
California: Bernard L. Wood.
Louisiana: Irving G. Couvillion.
Michigan: Lewis W. Jones.
New Jersey: Morton Dennis Meehan.
New York: Harry J. Potthoff.
Oregon: Jack Frost.



Pennsylvania: Joseph Stokes.

IN OTHER COUNTRIES

Australia: Ron Gurr.
Canada: George L. Loke.
Guatemala: Luis Diez.
India: H. W. Kamen.
Puerto Rico: Jose D. Caro Costas, Jr.

Recommendations for Station Reports

To make the work of compiling station reports as efficient as possible it is recommended that our Observers send in reports on post cards at any time during the month that the stations are logged. This allows the work of the editor to be spread out during the month instead of working on an enormous amount of mail around the 30th. Please remember to keep your information on stations logged specific! To further classify our recommendations of last month it is thought best that reports be arranged in three ways:

LISTENS AT NIAGARA FALLS

Meet Observer T. L. Grabek, at left, who covers short-wave reporting for upper New York state

HEARD—HOW FAR AWAY?

Below: The verification card of the Detroit 9-meter station. If Observers hear this station outside of the United States kindly report to RADIO NEWS



The DX for the

Conducted by

Laurence

- No. 1—New Stations
- No. 2—Station Changes
- No. 3—Exceptionally Fine "Catches"

No other information than this should be included on the card except the Observer's or listener's name and address and the fact that he is either a Listener or an Observer for his territory. A standard form for this would be the following:

NEW STATIONS

W2XAF, Schenectady, New York, 9530 kc., 31.4 meters, daily 4 p.m. to midnight, E.S.T. (from verifications).

STATION CHANGES

HCJB, Quito, Ecuador, changed frequency from 8900 kc. to 8590 kc., daily 1:30 to 4:30 a.m., E.S.T. (from announcement).

EXCEPTIONALLY FINE CATCHES

HS8PJ, Bangkok, Siam, 10,955 kc., 27.38 meters, Mondays 8 to 10 a.m., E.S.T. (from announcement).

This new form of reporting will enable

Affiliated DX Clubs

OUR editors hereby place a standing invitation to reliable DX clubs to become affiliated with the DX Corner, acting as advisors on short-wave activities in promoting short-wave popularity and reception efficiency. A list of associated organizations follows:

International DX'ers Alliance
Newark News Radio Club
Society of Wireless Pioneers
U. S. Radio DX Club
Radio Club Venezolano
World Wide Dial Club
International 6000-12,500 Mile Short-Wave Club
Globe Circlers DX Club
Radio Fellowship
Short-Wave Club of New York
National Radio Club
Universal Radio DX Club
Chicago Short-Wave Club
Mexican League of Radio Experimenters
Monongahela Radio Club
New Zealand DX Club
New Zealand DX Radio Association
Penang Wireless Society
Radio Club of Basel
Radio Short-Wave and Television Experimenters Association

DX listeners wishing to join any of these clubs and associations may write for information to the Short Wave DX Editor. Other clubs who wish to become affiliated should make application similarly. Clubs associated with the DX Corner have the privilege of sending in club notes for publication in RADIO NEWS.

Corner SHORT WAVES

M. Cockaday

us, it is hoped, to get all reports in the issue in which they were intended and will guarantee an up-to-date time-table.

Reports of Listening Post Observers and Other Short-Wave Readers of the DX Corner

Listed in the next column is this month's consolidated reports of short-wave stations heard by our wide world listening posts. Each item is credited with the Observer's surname. This allows our readers to note who obtained the information. If any of our Readers can supply Actual Time Schedules, Correct Wavelengths, Correct Frequencies and any other Important Information (in paragraphs as recommended) the DX Editor, as well as our Readers, will be grateful for the information. On the other hand, readers reading these reports can try their skill in pulling in the stations logged and in trying to get complete information on these transmissions. The report for this month, containing the best

Short-Wave Broadcasts in Foreign Languages

OSWALD F. SHUETT, President of the Short-Wave Institute of America, sends in the following information on news broadcasts, and on the short-waves, in various languages:

IN ARABIC

Country	Call Letters	Time—E.S.T.
France	FYA	11:15 a.m.

IN DUTCH

Germany	DJN, DJB	8:45 a.m.
Germany	DJN	11:15 a.m.

IN FRENCH

France	FYA	4:15 a.m.
France	FYA	8:00 a.m.
France	FYA	11:30 a.m.
France	FYA	1:30 p.m.
Italy	I2RO	2:00 p.m.
France	FYA	3:00 p.m.
France	FYA	7:15 p.m.

IN GERMAN

Germany	DJN, DJB	1:54:5 a.m.
Germany	DJA, DJN, DJB	10:05 a.m.
Germany	DJC, DJD	12:15 p.m.
Germany	DJC, DJD	4:00 p.m.
Germany	DJA, DJC, DJN	5:45 p.m.
Germany	DJZ, DJD, DJN	9:00 p.m.

IN ITALIAN

France	FYA	2:45 p.m.
Italy	I2RO	6:15 p.m.
Italy	I2RO	7:30 p.m.

IN SPANISH

France	FYA	5:30 p.m.
Spain	EAQ	5:45 p.m.
Germany	DJA, DJN	7:15 p.m.
France	FYA	7:40 p.m.
Germany	DJA, DJN	8:15 p.m.
Germany	DJN	10:30 p.m.



information available to date, follows:

EUROPE

Radio Phillips-Iberica, Madrid, Spain, reported heard on about 6740 kc., daily except Mondays, 6-7 p.m. (Meehan.) **Baxter and Andrews** say frequency is 6730 kc. **Prague**, Czechoslovakia, a new station as follows: Frequencies 15.32 mc., 15.23 mc., 11.76 mc., 11.74 mc., 9.5 mc., 6.055 mc. Watch out for them. (Stokes, Andrews.)

SPW, Warsaw, Poland, 13,635 kc., 21.9 meters, reported heard Sundays 5:30-11 a.m., and Mondays, Wednesdays and Fridays 11:30 a.m.-12:30 p.m., E.S.T. (Scheierman, Self, Partner, Shea.)

SM5SD, Stockholm, Sweden, 41.2 meters, reported heard Saturdays 7-8 a.m. (Scheierman.)

AN AMATEUR AND LISTENER

Below: A. S. Maher proudly displays his new 30-watt amplifier. Besides short-wave listening he operates station VK2JZ, shown in the background

MASSACHUSETTS DX CORNER

At right: Some of the receiving apparatus of listener I. Queen of Dorchester, an ardent short-wave fan



IS IT REALLY HJ4ABC?

This station which announces La Voz de Pereira is one that many listeners still insist is HJ4ABC. However, there is another station on 6451, Ibagu, Colombia, which uses this call. Does anyone know the correct call of the Pereira broadcaster?

LKJ1, Jeloy, Norway, 9530 kc., now being heard best at 4:45 a.m. (Shea, Mallet-Veale.)

GSC, Daventry, England, 9580 kc., now being heard very strongly 7:30 p.m. (Fritsch, Law, Joerger.)

GSI, Daventry, England, 21,530 kc., reported well heard at 9 a.m., E.S.T. (Lopez, Mallet-Veale.)

GSD, Daventry, England, 11,750 kc., reported heard best 9-10:55 p.m. (Jensen, Tucker, Sands, Pilgrim, DeLaet, Joerger.)

GSF, Daventry, England, 19.8 meters, heard best 9-10 a.m., E.S.T. (Mallet-Veale.)

(Turn to page 718)





A black and white illustration of a globe showing the Eastern Hemisphere, including Asia, Australia, and parts of Europe and Africa. The globe is tilted on its axis and mounted on a stand.

Hours of transmission for the World's Short Wave Broadcast Stations

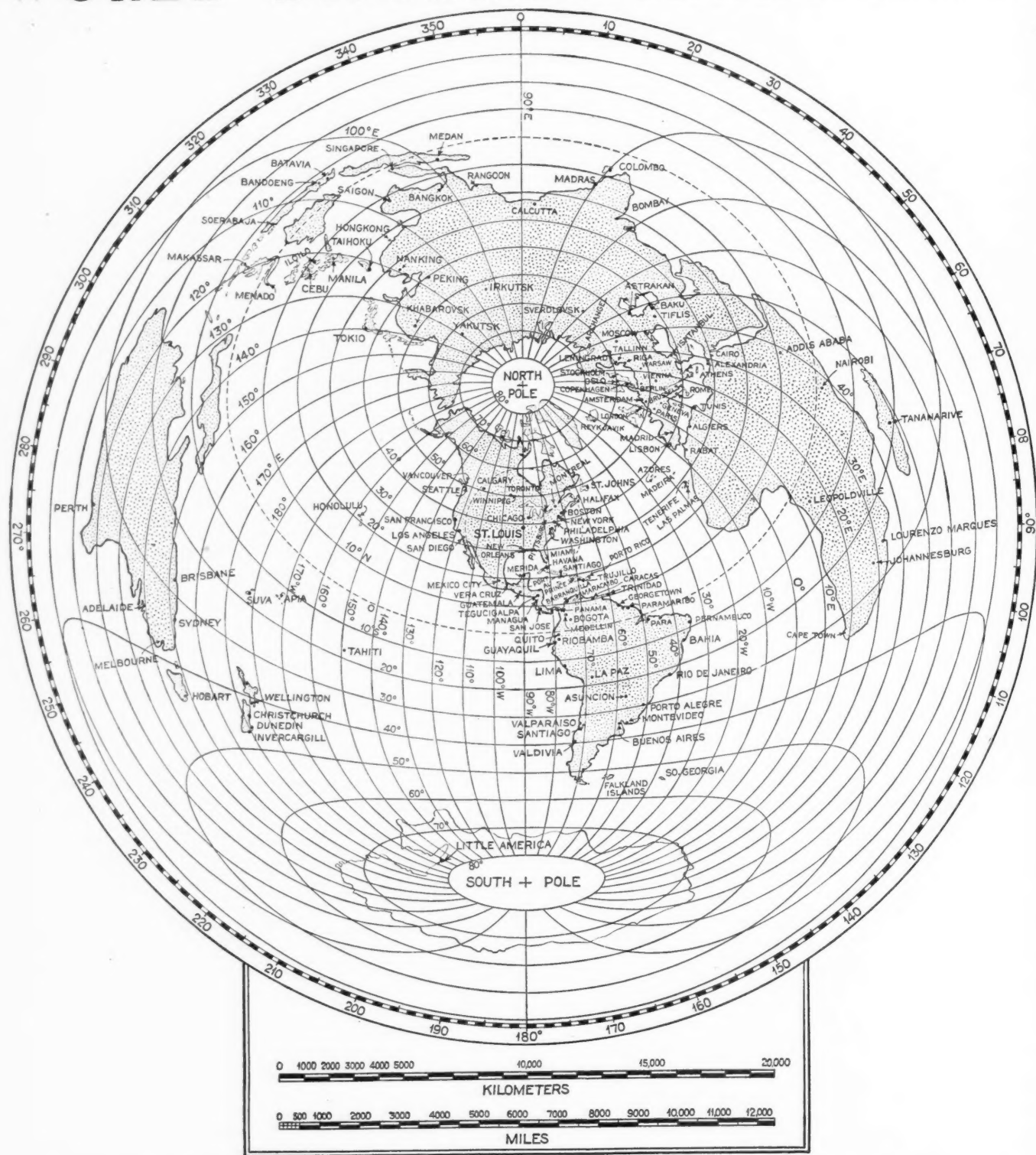
[illegible]

AL—Except Monday, Sunday
AM—Monday, Thursday
AN—Tuesday, Saturday
SA—Saturday
XA—Except Saturday, Sunday
XM—Except Monday
XS—Except Sunday
XSa—Except Saturday
XX—Tuesday, Thursday, Friday
XY—Except Tuesday, Sunday

WAVELENGTH-FREQUENCY CHART

M.	KC.	M.	KC.	M.	KC.	M.	KC.	M.	KC.	M.	KC.	M.	KC.	M.	KC.	M.	KC.
10.1	29,703	20.1	14,925	30.1	9,966.7	40.1	7,481.3	50.1	5,988.0	60.1	4,991.7	70.1	4,279.6	80.1	3,745.3	90.1	3,329.7
10.2	29,411	20.2	14,851	30.2	9,933.7	40.2	7,462.6	50.2	5,976.1	60.2	4,983.3	70.2	4,273.5	80.2	3,740.7	90.2	3,326.0
10.3	29,126	20.3	14,778	30.3	9,901.0	40.3	7,444.0	50.3	5,964.1	60.3	4,975.1	70.3	4,267.4	80.3	3,735.9	90.3	3,322.2
10.4	28,846	20.4	14,706	30.4	9,868.5	40.4	7,425.8	50.4	5,953.7	60.4	4,966.9	70.4	4,261.4	80.4	3,731.2	90.4	3,318.5
10.5	28,571	20.5	14,634	30.5	9,836.0	40.5	7,407.3	50.5	5,940.6	60.5	4,958.6	70.5	4,255.3	80.5	3,726.7	90.5	3,314.9
10.6	28,301	20.6	14,563	30.6	9,804.0	40.6	7,399.0	50.6	5,928.9	60.6	4,950.5	70.6	4,249.3	80.6	3,722.0	90.6	3,311.2
10.7	28,037	20.7	14,493	30.7	9,772.0	40.7	7,371.0	50.7	5,917.1	60.7	4,942.3	70.7	4,243.3	80.7	3,717.5	90.7	3,307.6
10.8	27,778	20.8	14,423	30.8	9,740.2	40.8	7,353.0	50.8	5,905.6	60.8	4,934.2	70.8	4,237.3	80.8	3,712.9	90.8	3,303.9
10.9	27,522	20.9	14,353	30.9	9,708.7	40.9	7,335.0	50.9	5,893.9	60.9	4,926.1	70.9	4,231.3	80.9	3,708.3	90.9	3,300.3
11.0	27,273	21.0	14,285	31.0	9,677.4	41.0	7,317.5	51.0	5,882.5	61.0	4,918.0	71.0	4,225.3	81.0	3,703.7	91.0	3,296.7
11.1	27,027	21.1	14,218	31.1	9,646.2	41.1	7,299.3	51.1	5,870.9	61.1	4,910.0	71.1	4,219.4	81.1	3,699.2	91.1	3,293.1
11.2	26,786	21.2	14,151	31.2	9,615.5	41.2	7,281.5	51.2	5,859.4	61.2	4,902.0	71.2	4,213.5	81.2	3,694.6	91.2	3,289.4
11.3	26,549	21.3	14,085	31.3	9,584.7	41.3	7,263.8	51.3	5,847.9	61.3	4,894.0	71.3	4,207.6	81.3	3,690.0	91.3	3,285.8
11.4	26,316	21.4	14,019	31.4	9,554.0	41.4	7,246.3	51.4	5,836.0	61.4	4,886.0	71.4	4,201.7	81.4	3,685.5	91.4	3,282.2
11.5	26,087	21.5	13,954	31.5	9,523.8	41.5	7,228.8	51.5	5,825.1	61.5	4,878.0	71.5	4,195.7	81.5	3,680.9	91.5	3,278.7
11.6	25,862	21.6	13,889	31.6	9,493.6	41.6	7,211.5	51.6	5,813.9	61.6	4,870.1	71.6	4,189.0	81.6	3,676.5	91.6	3,275.1
11.7	25,641	21.7	13,825	31.7	9,463.7	41.7	7,194.2	51.7	5,802.7	61.7	4,862.2	71.7	4,184.1	81.7	3,672.0	91.7	3,271.5
11.8	25,424	21.8	13,761	31.8	9,433.8	41.8	7,177.0	51.8	5,791.6	61.8	4,854.3	71.8	4,178.3	81.8	3,667.5	91.8	3,268.0
11.9	25,210	21.9	13,699	31.9	9,404.4	41.9	7,160.0	51.9	5,780.3	61.9	4,846.6	71.9	4,172.5	81.9	3,663.0	91.9	3,264.4
12.0	25,000	22.0	13,636	32.0	9,375.0	42.0	7,142.8	52.0	5,769.0	62.0	4,838.7	72.0	4,166.7	82.0	3,658.6	92.0	3,260.8
12.1	24,793	22.1	13,575	32.1	9,345.6	42.1	7,125.9	52.1	5,758.1	62.1	4,830.9	72.1	4,160.8	82.1	3,654.1	92.1	3,257.3
12.2	24,590	22.2	13,514	32.2	9,316.6	42.2	7,109.0	52.2	5,747.1	62.2	4,823.1	72.2	4,155.1	82.2	3,649.7	92.2	3,253.8
12.3	24,390	22.3	13,453	32.3	9,288.0	42.3	7,092.2	52.3	5,736.1	62.3	4,815.3	72.3	4,149.4	82.3	3,645.2	92.3	3,250.3
12.4	24,193	22.4	13,393	32.4	9,259.2	42.4	7,075.3	52.4	5,725.2	62.4	4,807.8	72.4	4,143.6	82.4	3,640.8	92.4	3,246.8
12.5	24,000	22.5	13,333	32.5	9,230.8	42.5	7,058.8	52.5	5,714.2	62.5	4,800.0	72.5	4,137.9	82.5	3,636.4	92.5	3,243.2
12.6	23,809	22.6	13,274	32.6	9,202.4	42.6	7,042.2	52.6	5,703.4	62.6	4,792.3	72.6	4,132.2	82.6	3,631.9	92.6	3,239.7
12.7	23,622	22.7	13,216	32.7	9,174.2	42.7	7,025.7	52.7	5,692.6	62.7	4,784.7	72.7	4,126.6	82.7	3,627.5	92.7	3,236.2
12.8	23,437	22.8	13,158	32.8	9,146.4	42.8	7,009.3	52.8	5,682.1	62.8	4,777.0	72.8	4,120.9	82.8	3,623.2	92.8	3,232.7
12.9	23,256	22.9	13,100	32.9	9,118.4	42.9	6,993.0	52.9	5,671.0	62.9	4,769.4	72.9	4,115.2	82.9	3,618.8	92.9	3,229.2
13.0	23,077	23.0	13,043	33.0	9,091.0	43.0	6,976.7	53.0	5,660.0	63.0	4,761.9	73.0	4,109.6	83.0	3,614.4	93.0	3,225.8
13.1	22,901	23.1	12,987	33.1	9,063.4	43.1	6,960.5	53.1	5,649.7	63.1	4,754.3	73.1	4,103.9	83.1	3,610.1	93.1	3,222.3
13.2	22,722	23.2	12,931	33.2	9,036.0	43.2	6,944.4	53.2	5,639.1	63.2	4,746.8	73.2	4,098.4	83.2	3,605.7	93.2	3,218.8
13.3	22,556	23.3	12,875	33.3	9,009.0	43.3	6,928.3	53.3	5,628.5	63.3	4,739.3	73.3	4,092.8	83.3	3,601.4	93.3	3,215.4
13.4	22,388	23.4	12,820	33.4	8,982.0	43.4	6,912.4	53.4	5,618.0	63.4	4,731.9	73.4	4,087.2	83.4	3,597.1	93.4	3,211.9
13.5	22,224	23.5	12,766	33.5	8,955.2	43.5	6,896.5	53.5	5,607.5	63.5	4,724.4	73.5	4,081.6	83.5	3,592.7	93.5	3,208.6
13.6	22,059	23.6	12,712	33.6	8,928.6	43.6	6,880.7	53.6	5,597.0	63.6	4,716.9	73.6	4,076.1	83.6	3,588.5	93.6	3,205.1
13.7	21,898	23.7	12,658	33.7	8,902.0	43.7	6,865.0	53.7	5,586.6	63.7	4,709.5	73.7	4,070.6	83.7	3,584.2	93.7	3,201.7
13.8	21,739	23.8	12,605	33.8	8,875.4	43.8	6,849.3	53.8	5,576.2	63.8	4,702.2	73.8	4,065.0	83.8	3,580.0	93.8	3,198.3
13.9	21,583	23.9	12,553	33.9	8,849.6	43.9	6,833.8	53.9	5,565.9	63.9	4,694.8	73.9	4,059.5	83.9	3,575.7	93.9	3,194.8
14.0	21,429	24.0	12,500	34.0	8,823.4	44.0	6,818.2	54.0	5,555.6	64.0	4,687.5	74.0	4,054.1	84.0	3,571.4	94.0	3,191.5
14.1	21,277	24.1	12,448	34.1	8,797.8	44.1	6,802.7	54.1	5,545.3	64.1	4,680.1	74.1	4,048.5	84.1	3,567.2	94.1	3,188.1
14.2	21,127	24.2	12,397	34.2	8,771.8	44.2	6,787.3	54.2	5,535.0	64.2	4,672.8	74.2	4,043.2	84.2	3,562.9	94.2	3,184.7
14.3	20,979	24.3	12,345	34.3	8,746.4	44.3	6,772.0	54.3	5,524.9	64.3	4,665.7	74.3	4,037.6	84.3	3,558.7	94.3	3,181.4
14.4	20,833	24.4	12,295	34.4	8,720.8	44.4	6,756.8	54.4	5,514.6	64.4	4,658.3	74.4	4,032.3	84.4	3,554.5	94.4	3,178.0
14.5	20,690	24.5	12,245	34.5	8,695.6	44.5	6,741.6	54.5	5,504.5	64.5	4,651.1	74.5	4,026.8	84.5	3,550.3	94.5	3,174.6
14.6	20,548	24.6	12,194	34.6	8,670.4	44.6	6,726.5	54.6	5,494.5	64.6	4,644.0	74.6	4,021.5	84.6	3,546.1	94.6	3,171.2
14.7	20,408	24.7	12,146	34.7	8,645.6	44.7	6,711.3	54.7	5,484.4	64.7	4,636.8	74.7	4,016.1	84.7	3,541.9	94.7	3,167.9
14.8	20,270	24.8	12,097	34.8	8,620.6	44.8	6,696.3	54.8	5,474.5	64.8	4,629.6	74.8	4,010.7	84.8	3,537.7	94.8	3,164.5
14.9	20,134	24.9	12,048	34.9	8,595.8	44.9	6,681.3	54.9	5,464.5	64.9	4,622.6	74.9	4,005.4	84.9	3,533.5	94.9	3,161.2
15.0	20,000	25.0	12,000	35.0	8,571.4	45.0	6,666.7	55.0	5,454.6	65.0	4,615.4	75.0	4,000.0	85.0	3,529.4	95.0	3,157.9
15.1	19,867	25.1	11,952	35.1	8,547.0	45.1	6,652.1	55.1	5,444.7	65.1	4,608.3	75.1	3,994.6	85.1	3,525.2	95.1	3,154.6
15.2	19,737	25.2	11,905	35.2	8,522.8	45.2	6,637.1	55.2	5,434.7	65.2	4,601.2	75.2	3,989.4	85.2	3,521.1	95.2	3,151.2
15.3	19,608	25.3	11,858	35.3	8,498.6	45.3	6,622.5	55.3	5,424.9	65.3	4,594.3	75.3	3,984.1	85.3	3,517.0	95.3	3,147.8
15.4	19,480	25.4	11,811	35.4	8,474.6	45.4	6,608.1	55.4	5,415.1	65.4	4,587.1	75.4	3,978.8	85.4	3,512.8	95.4	3,144.4
15.5	19,355	25.5	11,765	35.5	8,450.6	45.5	6,593.4	55.5	5,405.4	65.5	4,580.1	75.5	3,973.5	85.5	3,508.7	95.5	3,141.1
15.6	19,231	25.6	11,719	35.6	8,427.0	45.6	6,579.0	55.6	5,395.7	65.6	4,573.2	75.6	3,968.3	85.6	3,504.7	95.6	3,138.1
15.7	19,108	25.7	11,673	35.7	8,403.4	45.7	6,564.5	55.7	5,385.9	65.7	4,566.1	75.7	3,963.0	85.7	3,500.5	95.7	3,134.8
15.8	18,987	25.8	11,628	35.8	8,380.0	45.8	6,550.1	55.8	5,376.4	65.8	4,559.2	75.8	3,957.7	85.8	3,496.5	95.8	3,131.5
15.9	18,868	25.9	11,583	35.9	8,356.6	45.9	6,536.0	55.9	5,366.7	65.9	4,552.3	75.9	3,952.5	85.9	3,492.5	95.9	3,128.2
16.0	18,750	26.0	11,538	36.0	8,333.3	46.0	6,521.5	56.0	5,357.1	66.0	4,545.5	76.0	3,947.4	86.0	3,488.3	96.0	3,125.0
16.1	18,633	26.1	11,494	36.1	8,310.2	46.1	6,507.6	56.1	5,347.6	66.1	4,538.6	76.1	3,942.2	86.1	3,484.3	96.1	3,121.8
16.2	18,518	26.2	11,450	36.2	8,287.2	46.2	6,493.5	56.2	5,338.0	66.2	4,531.7	76.2	3,937.0	86.2	3,480.2	96.2	3,118.4
16.3	18,405	26.3	11,407	36.3	8,264.4	46.3	6,479.4	56.3	5,328.6	66.3	4,524.9	76.3	3,931.9	86.3	3,476.2	96.3	3,115.2
16.4	18,293																

WORLD DISTANCE CHART No. 8



World Distance Map for Central North America

Compiled by
John M. Borst

ABOVE is shown the eighth exclusive azimuthal-projection map of the world with the center at St. Louis, Mo. It was made in response to many requests by readers living in the Middle West. The distance and direction from St. Louis to any point of the world can be measured off by means of the scales. The easiest way is to use a ruler or a compass and refer to the scale at the bottom. Besides the distance and direction, the map also shows the intervening territory between any point on the globe and St. Louis. So, for instance, the direction from St. Louis to Singapore is nearly straight

North, and in the winter the path is always in dark in the vicinity of the north pole, that's why you can hear the 50-meter transmissions in early morning.

The map also can be used to advantage by residents living within 1500 miles of St. Louis in any direction (within the dotted circle). The distance measured from spots within the circle will be only slightly less accurate. The direction however cannot be referred to the degrees on the edge of the map.

Further extensions of the use of the

map are possible; you can measure the distance between any two points when the line connecting these two points passes through the dotted circle. This can be done when the points are on the same side of the circle or if they are on either side of it. The network of parallels and meridians for an azimuthal map is the same for any given latitude. Disregarding the map, but using the network, anyone who lives on 38° 38' North or South latitude could renumber the meridians and locate any desired spot on earth by means of it. The distance and direction are then found in the usual way.

Where to Write for Short-Wave Veri's

(Call Letters, Station Slogans, Addresses)

The short-wave listener often wishes to write a letter to a short-wave station he has heard, especially if it is on the other side of the world, to report on reception and to get a "veri" (verification) of his feat of actually hearing the program. The following list tells him just where to write.

Call	Name or Slogan	Address	Call	Name or Slogan	Address
CB960 CEC	"El Praco"	P.O. Box 1342, Santiago, Chile Compania Internacional de Radio S.A. Casilla 16-D, Santiago, Chile	HIG	"Portavoz de la Farmacia Legalidad"	Trujillo, D. R.
CFN, CFU		Consolidated Mining & Smelting Co. of Canada, Ltd., Slate Creek, B. C., Canada	HIH HIL HIT HIX	"La Voz del Higuamo" "La Voz de la R.C.A.-Victor"	San Pedro de Macoris, D. R. Box 623, Trujillo, D. R. Box 1105 Trujillo, D. R. Mr. J. R. Saladin, Director station HIX, Trujillo, D. R.
CGA, CJA, etc.		Canadian Marconi Co., P.O. Box 1690, Montreal, Que., Canada	HIZ HIA	"La Voz del Yaque"	Calle Duarte 68, Trujillo, D. R. P.O. Box 423, Santiago de los Caballeros, D. R.
CGP, CZQ, VXX		North-West Telephone Co., 768 Seymour St., Vancouver, B.C., Can.	HIJ		P.O. Box 204, San Pedro de Macoris, D. R.
CHNX	"The Key Station of the Maritimes"	Maritime Broadcasting Co. Ltd., P.O. Box 998, Halifax, N.S., Canada	HI1S HI3C HI3U HI4D HI4V HI9B	"La Voz de la Hispaniola" "La Voz de Rio Dulce" "La Voz del Comercio" "La Voz de Quisqueya" "La Voz de la Marina" "Broadcasting Hotel Merce- des, Broadcasting Columbus"	Puerto Plata, D. R. La Romana, D. R. Santiago de los Caballeros, D. R. Trujillo, D. R. Calle Duarte 48, Trujillo, D. R. P.O. Box 95, Santiago de los Cabal- leros, D. R.
CJRO, CJRX		Jas. Richardson and Sons Ltd., Royal Alexandra Hotel 155, Winni- peg, Manitoba, Canada	HI5M	"La Voz del Almacén Dominicano"	Santiago de los Caballeros, D. R.
CMB2		Cuba Transatlantic Radio Corp., Havana, Cuba	HJA3		Compania Telefonica de Barranquilla, Apartado Nacional 263, Barran- quilla, Colombia
CNR	"Radio Maroc"	L'Inspecteur General, Directeur de l'Office des Postes, Rabat, Morocco	HJB		Marconi's Wireless Telegraph Co. Ltd., Apartado 1591, Bogota, Colombia
COCD COCH COCO COKG (C09GC) CO9JQ	"La Voz del Aire"	P.O. Box 2294, Havana, Cuba Calle B. No. 2, Vedado, Havana, Cuba P.O. Box 98, Havana, Cuba Apartado 137, Santiago, Cuba Calle del General Gomez No. 4, Camaguey, Cuba	HJN HJU	"Radio-emisora Nacional" "La Voz del Pacifico"	Bogota, Colombia Ferrocarriles Nacionales, Buenaven- tura, Colombia
CO9WR CP5, CP6, CP7	"Radio Illimani"	P.O. Box 85, Sancti Spiritus, Cuba Compania Radio Boliviana, Calle Socabaya 231, La Paz, Bolivia	HJ1AB HJ1ABC	"La Voz de Barranquilla" "La Voz de Choco"	P.O. Box 715, Barranquilla, Colombia Intendencia de Choco, Director of Public Education, Quibdo, Choco, Colombia
CQN CR6AA	"Radio Eddystone"	General Post Office, Macao, Asia P.O. Box 103, Lobito, Angola, Portuguese W. Africa	HJ1ABE HJ1ABG HJ1ABH HJ1ABJ HJ2ABA HJ2ABC HJ3ABD HJ3ABF HJ3ABH HJ3ABI HJ4ABA HJ4ABB HJ4ABC HJ4ABD HJ4ABE HJ5ABC HJ5ABD HJ5ABE	"La Voz de los Laboratorios Fuentes" "La Voz del Atlantico" "La Voz de Cienaga" "La Voz de Santa Marta" "La Voz del Pais" "La Voz de Cucuta" "Colombia Broadcasting" "La Voz de Bogota" "La Voz de la Victor" "Ecos de la Montana" "Radio Monte Carlo" "La Voz de Pereira" "Ecos del Combeima" "La Voz de Castilla" "La Voz de Antioquia" "La Voz de Colombia" "La Voz del Valle"	P.O. Box 31, Cartagena, Colombia Apartado 445, Barranquilla, Colombia Cienaga, Colombia Santa Marta, Colombia Tunja, Colombia Cucuta, Colombia Alford Radio, Calle 16 No. 5-40, Bogota, Colombia Apartado Postal 317, Bogota, Colombia Apartado 565, Bogota, Colombia Apartado 513, Bogota, Colombia Medellin, Colombia Manizales, Colombia Pereira, Colombia Box 39, Ibague, Colombia Medellin, Colombia Medellin, Colombia Calle 12 no. 235, Cali, Colombia Cali, Colombia Cia. Radiodifusora Colombiana, Apar- tado 50, Cali, Colombia Apartado 37, Cartagena Colombia Observatorio Nacional de San Bar- tolomew, Bogota, Colombia Ministry of War, Bogota, Colombia Apartado 910, Panama City, Panama Cia. de Servicio Publico de Radio S. A., Apartado 867, Panama City, Panama
CR7AA		Gremia dos Radiofilos da Colonia de Mozambique, Caixa Postal 594, Lourenço Marques, Mozambique	HKE	"Radiodifusora Cartagena"	Observatorio Nacional de San Bar- tolomew, Bogota, Colombia
CSL CT1AA	"Emissora Nacional" "Radio Colonial"	Lisbon, Portugal Av. Duque de Avila 86, Lisbon, Portugal	HKV HP5B HP5F HP5J	"Estacion Miramar" "La Voz de Colon" "La Voz de Panama"	Ministry of War, Bogota, Colombia Apartado 910, Panama City, Panama Cia. de Servicio Publico de Radio S. A., Apartado 867, Panama City, Panama
CT1CT	"Estacao Radio Eddystone"	Rua Carvalho Araujo 97 -3 D, Lisbon, Portugal	HRN HRP1	"La Voz de Honduras" "El Eco de Honduras en San Pedro Sula"	Tegucigalpa, Honduras San Pedro Sula, Honduras
CT1GL, CT1GO		Radio Club Portugues, Parede, Portugal	HRV HRW	"La Voz de Atlantica"	La Ceiba, Honduras Tropical Fruit Importers, La Faba, Honduras
CT2AJ DAF, DAN		Ponta Delgada, San Miguel, Azores Hauptfunkstelle Norddeich, Norden- Land, Germany	HRY HVJ		Tropical Fruit Importers, Tela, Honduras
DDBR, DDPC, DDFF, DDFT DHAO, DHDL, DHEY, DHJZ, DHRL DOAH, DOAL		North German Lloyd, Pier 42 North River, New York City Hamburg American Lines, Pier 86 North River, New York City North German Lloyd, Pier 4, Foot of 58th Street, Brooklyn, N. Y. Reichspostzentramt, Schoeneberger Strasse 11-15, Berlin-Tempelhof, Germany	IAC IRM, IRW, etc.		Pontificia Academia della Scienze, Roma-Castino Pio IV, Vatican City
DFA, DFB, all Nauen stations		Reichsrundfunkgesellschaft, Haus des Rundfunks, Berlin-Charlottenburg 9, Germany	I2RO, 2RO	"Prato Smeraldo"	Radio Maritime Coltano, Pisa, Italy Societe Italo Radio, Servizi Radio- elettrici, Via Calabua 46-48, Rome, Italy
DJA, DJB, all Zeesen sta.		Reichsrundfunkgesellschaft, Haus des Rundfunks, Berlin-Charlottenburg 9, Germany	JIA, JIB, JIC		Ente Italiano Audizione Radio- foniche, 5 Via Montello, Rome, Italy
EAQ		Transradio Espanola, Apartado 951, Madrid, Spain	JVC, JVD, all Nazaki sta		Kokusai-Denwa Kaisha, Tyureki Station, Tyureki, Formosa
FIU	"Radio Tananarive"	Administration des Postes, des Tele- graphes et des Telephones, Tanan- arive, Madagascar	JYK, JYR, Kemikawa Stations		Kokusai-Denwa Kaisha Ltd., Osaka Bldg., Kojimachiku, Tokio, Japan Kemikawa Sending Station, Kemi- kawa Cho, Chiba-Ken, Japan Manchukuo Telephone and Tele- graph Co., Shinkyo, Manchukuo
FNSK		French Lines, Pier 88 North River, New York City	JZA, TDE, TDD		
FNSM, FTNQ		French Lines, Pier 57 North River, New York City			
FQO, FRO, FTA, Ste. Assise stations		Societe Francaise Radio-electrique 79 Bvd. Haussman, Paris (8), France			
FYA	"Radio Coloniale"	Bvd. Haussman 98 bis, Paris (8), France			
FZR, FZS		Cie. Generale de T. S. F., P.O. Box 238, Saigon, French Indo-China			
GAA, GBA, all Rugby sta		Engineer-in-Chief, GPO (Radio Sec- tion), Armour House, St. Marins Le Grand, London EC1, England			
GBZW, all British ships		International Marine Radio Co. Ltd. Connaught House, 63 Aldwych, London WC2, England			
HAS, HAT	"Justice for Hungary"	Research Labs. for Electrical Com- munication of the Hungarian Post, Gyalu-ut 22, Budapest, Hungary			
HBL, HBO, HBP, etc.	"Radio Nations"	Information Section, League of Nations, Geneva, Switzerland			
HB9B		Radio Club Basle; P.O. Box Basle 1 Switzerland			
HCETC HCJB HC2CW HC2J8B HC2RL HH2S	"Teatro Bolivar" "La Voz de los Andes" "Ondas del Pacifico" "Ecuador Radio"	Casilla 134, Quito, Ecuador Casilla 691, Quito, Ecuador P.O. Box 1166, Guayaquil, Ecuador Guayaquil, Ecuador Box 759, Guayaquil, Ecuador Societe Haitienne de Radiodiffusion Port-au-Prince, Haiti P.O. Box A-117, Port-au-Prince, Haiti			
HH3W					

Call	Name or Slogan	Address	Call	Name or Slogan	Address
KAX, KBI, etc. Manila stations		Radio Corp. of the Philippines Plaza Moraga, Manila, P. I.	VK3ME		Amalgamated Wireless (Australasia) Ltd., Box 1272 L, Elizabeth St. P.O., Melbourne, Australia
KEB, KEC, etc., Bolinas Stations		RCA Communications, Inc., Pacific Division, 28 Geary St., San Francisco, Calif.	VK3XX		501 Royal Parade, Rockville N-2, Melbourne, Australia
KWN, KWO, etc., Dixon stations		Transpacific Communication Co., Ltd., 140 Montgomery St., San Francisco, Calif.	VK3ZX		33 Saturn St., Caulfield, Australia
KZGH, KZGF, etc.		Philippine Long Distance Telephone Co., Manila, P. I.	VP1A, VPD	"Radio Suva"	Amalgamated Wireless (Australasia) Ltd., Suva, Fiji Islands
LKJ1		Dept. of Commerce, Division of Radio Telegraphy, Oslo, Norway	VP3BG		1 Wellington St., Georgetown, Brit. Guiana
LRU, LRX	"Radio El Mundo"	Maipu 555, Buenos Aires, Argentina	VP3MR	"The Voice of Guiana"	Georgetown, Brit. Guiana
LSL, LSM, all Hurlingham stations		Compania Internacional de Radio, Defensa 143, Buenos Aires, Argentina	VQ7LO		Cable and Wireless, Ltd., P. O. Box 777, Nairobi, Kenya, Africa
LSF, LSX, LSY, Monte Grande Stations		Transradio Internacional, San Martin 329, Buenos Aires, Argentina	VUB, VUY		Indian State Broadcasting Service, Irwin House, Sprott Road, Ballard Estate, Bombay, India
OAX4D	"Radio DUSA", "The Voice of Peru"	All American Cables, Casilla 2336, Lima, Peru	VXX		North West Telephone Co., 768 Seymour St., Vancouver, B. C., Canada
OAX4G		Robert Grellaud & Cia., Apartado 1242, Lima, Peru	WMI, WOO, etc. Stations at Deal, Lawrenceville and Ocean Gate, N. J.		American Telephone and Telegraph Co., Long Lines Dept., 32 Sixth Ave., New York, N. Y.
OER2, OER3		Oesterr. Radioverkehrs A. G., Johannesgasse 46, Vienna, Austria	WAJ, WEF, stations at Rocky Point		R.C.A. Central Frequency Bureau, 66 Broad St., New York, N. Y.
ORG, ORK, ORP	"Belradio"	Direction des Radiocommunications, Brussels, Belgium	WVD		Alaskan Telephone Co., 517 Federal Office Bldg., Seattle, Wash.
OXY		Statens Radiotjeneste, Heibergsgade 7, Copenhagen, Denmark	W1XAL		World Wide Broadcasting Co., 70 Brookline Ave., Boston, Mass.
PCJ		Philips Radio, Emmasingel, Eindhoven, Holland	W1XK		Westinghouse Radio Stations in New England, Hotel Bradford, Boston, Mass.
PHI		PHOHI Studios, Hilversum, Holland	W2XAD, W2XAF	"The Voice of Electricity"	General Electric Co., 1 River Road, Schenectady, N. Y.
PIJ		Middelbare Technische School, Oranjestad 12, Dordrecht, Holland	W2XE		Columbia Broadcasting System, 485 Madison Ave., New York, N. Y.
PLV and other Bandoeng stations		Mr. H. Van der Veen, Engineer-in-Charge, Java Radio Stations, Bandoeng, Java, N. E. I.	W3XAL, W3XL		National Broadcasting Co., 30 Rockefeller Plaza, New York, N. Y.
PPQ, PSB, all Sepetiba and Maripicu stations		Compania Telegrafica Brasileira, Caixa Postal 500, Rio de Janeiro, Brazil	W3XAU		WCAU Bldg., 1622 Chestnut St., Philadelphia, Pa.
PRADO	"El Prado"	Apartado de correos 98, Riobamba, Ecuador	W4XB		c/o WIOD, News Tower, Miami, Fla.
PRA8	"A Voz do Norte"	Avenida Cruz Cabuga 394, Pernambuco, Brazil	W8XAL	"The Nation's Station"	Crosley Radio Corp., Cincinnati, Ohio
RV15	"Far East Radio Station"	Radio Committee, Khabarovsk, Siberia	W9XAA	"Voice of Farmer and Labor"	Chicago Federation of Labor, 666 Lake Shore Drive, Chicago, Ill.
RV59, RNE		Radio Centre, Solianka 12, Moscow, U.S.S.R.	W9XBS, W9XF		National Broadcasting Co., Merchandise Mart, Chicago, Ill.
SM5SD		Lumas Kortvagssandare, Stockholm 20, Sweden	XBQJ		P.O. Box 2825, Mexico, D.F., Mexico
SPW		Polskie Radio S.A., Kredytowa 1, Warsaw, Poland	XEBT	"El Buen Tono"	Apartado 79-44, Mexico D.F., Mexico
SUV, SUX		Marconi Radio Telegraph Co., of Egypt, Box 795, Cairo, Egypt	XECW	"Del Caballero Xantocam"	Calle del Bajio 120, Xantocam, Mex. Cia. Radiofonografia, Apartado 197, Guadalajara, Jalisco, Mexico
TFK, TFJ, TEL		Icelandic State Broadcasting, Box 457, Reykjavik, Iceland	XEDQ	"La Voz de Veracruz"	Ave. Independencia 28, Veracruz, Vera., Mexico
TGS		Radiotransmisor de la Casa Presidencial, Guatemala City, Guatemala	XEFT	"El Eco de Sotavento desde Veracruz"	Ave. Independencia 98, Veracruz, Vera., Mexico
TGW, TGWA, TG1X	"Radiodifusora Nacional"	Guatemala City, Guatemala	XEUW	"The Voice of the World"	Apartado 2874, Mexico, D.F., Mexico
TG1A	"Ministerio de Fomento"	Guatemala City, Guatemala	XEVI		Secretary of Public Education, Mexico, D.F., Mexico
TG2X	"La Voz de Policia Nacional"	Guatemala City, Guatemala	XEXA		80 Love Lane, Shanghai, China
TIEP	"La Voz del Tropico"	Apartado 257, San Jose, Costa Rica	XQAJ		Liga Mexicana de Radio experimentadores, Mexico, D.F., Mexico
TIGPH	"Alma Tica"	P. O. Box 775, San Jose, Costa Rica	XICB		Chief Engineer, 6th District, Post Telegraph and Telephone Service, Medan, Sumatra, N. E. I.
TIPG	"La Voz de la Victor"	Apartado 225, San Jose, Costa Rica	YBJ		Box 830, New Orleans, La.
TIRCC	"Radioemisora Catolica Costarricense"	Apartado 40, San Jose, Costa Rica	YNE		Calle 15 de Septiembre 206, Managua, Nicaragua
TI5HH	"La Voz de San Ramon"	San Ramon, Costa Rica	YNLF	"La Voz de los Lagos"	Managua, Nicaragua
VE9AS		University of New Brunswick, Fredericton, N. B., Canada	YNIGG	"Estacion Nacional de Radio"	Maracay, Venezuela
VE9BJ		C. A. Munro, Ltd., 16 Simonds St., St. John's, N. B.	YVQ	"Radio Caracas"	Apartado 2009, Caracas, Venezuela
VE9BK		Radio Sales and Service, Ltd., 780 Beatty St., Vancouver, B. C., Canada	YV2RC	"Radiodifusora Venezuela"	Paseo Ramella, Caracas, Venezuela
VE9CA	"The Voice of the Prairies"	Western Broadcasting Co., Toronto General Trusts Bldg., Calgary, Alberta, Canada	YV3RC		P. O. Box 983, Caracas, Venezuela
VE9CS		Radio Service Engineers, 734 Davie St., Vancouver, B. C., Canada	YV4RB	"Ecos del Caribe"	Apartado de Correos 214, Maracaibo, Venezuela
VE9DN, VE9DR		Canadian Marconi Co., P. O. Box 1690, Montreal, Que., Canada	YV5RMO		Valencia, Venezuela
VE9EH		The Island Radio Broadcasting Co., Ltd., Charlottetown, P. E. I., Canada	YV6RV	"La Voz de Carabobo"	P. O. Box 100, Maracaibo, Venezuela
VK2ME		Amalgamated Wireless (Australasia) Ltd., 47 York St., Sydney, Australia	YV7RMO	"Radiodifusora Maracaibo"	Barquisimeto, Venezuela
VK3LR		Postmaster General's Dept., Treasury Gardens, Melbourne C2, Australia	YV8RB	"La Voz de Lara"	Maracay, Venezuela
			YV12RM	"Emisora 12 de Julio"	P. O. Box 200, Hong Kong, China
			ZGE		Malayan Amateur Radio Society, Kuala Lumpur, F. M. S.
			ZHI		Radio Service of Malaya, 2 Orchard Road, Singapore, F. M. S.
			ZHJ		Penang Wireless Society, 40 Park Road, Penang, Straits Settlements
			ZP10	"Rueda del Oeste"	Asuncion, Paraguay

ASIA

The DX Corner
(Short Waves)

(Continued from page 718)

reported heard Sunday morning. (D. Smith.)

CT1AA, Lisbon, Portugal, now transmitting on 9650 kc., 31.25 meters, 2 kw., Tuesdays, Thursdays and Saturdays, 4-7 p.m. (Wickham, Sahlbach, Koehnlein, Sands, Loke, Mallet-Veale.) Fletcher says the frequency is 9660 kc.

RV59, Moscow, U. S. S. R., 6000 kc., has an English program at 3 p.m. Wednesdays. They go off the air at 6 p.m. daily. (Bourne, Zarn, Shea.)

JVT, Nazaki, Japan, 6750 kc., program now continues as follows: 7-10 p.m., 9:40-9:45 p.m., 10:40-11:10 p.m., 1:50-2:20 a.m., 4-7:30 a.m., 7:30-8 a.m., 5:20-5:40 p.m., E.S.T. (Messer, Se-right, Holmgren, Holt, Cigoj, Wolf, Dressler, Parson, Morgan, Frost, Amos, Rodriguez, Hull, Meehan, Gallagher, Pickering.)

JVN, Nazaki, Japan, 10,660 kc., same program as above. (Same Observers.)

JVM, Nazaki, Japan, 10,740 kc., same program as above. (Same Observers.)

JVH, Nazaki, Japan, 14,600 kc., beamed to North America, 12 midnight-1 a.m., E.S.T. (Bourne, Lopez.)

JVD, Nazaki, Japan, 15,860 kc., reported heard 6-8 p.m., E.S.T. (Hull, Pilgrim.)

RV15, Khabarovsk, U. S. S. R., 4273 kc., reported heard 8-11 a.m., E.S.T. (Wolf.)

HS8PG, Bangkok, Siam, 10,955 kc., 27.38 meters, reported heard Mondays only, 8-10 a.m., E.S.T. (Twomey, G. Smith, Howald, Butcher, Godee, Frost, Westman.) Reported heard 10:30-11 a.m., E.S.T. (Moore.) Reported heard 2-3 p.m. (Mallet-Veale.)

ZGR, Federated Malay States, 49.02 meters, has musical programs in the afternoon. (Lawton.)

FZR, Indo-China, 31.49 meters, reported heard broadcasting music at 8 a.m., E.S.T. (Lawton.)

ZBW, Hongkong, China, 8750 kc., 55.45 meters, reported broadcasting simultaneously at 12 midnight. (Lawton.)

(Turn to page 756)

SHORT-WAVE STATION LIST

(Wavelength, Frequency, Call, Location, Power and Service)

All Time is Eastern Standard Time

Meters	Kc.	Call	Location	Kw.	Service, etc.	Meters	Kc.	Call	Location	Kw.	Service, etc.
0.75	400,000	to	Storrs, Conn.	0.5	Exp.	16.23	18,480	HBH	Prangins, Switzerland	20.0	Phone
3.49	86,000	to	New York, N. Y.	....	Exp.	16.27	18,440	HJY	Bogota, Colombia	....	Phone to CEC, LSR, OCI, WNC
3.49	86,000	W2XDV	Boston, Mass.	....	Exp.; relays WNAC	16.30	18,400	PCK	Kootwijk, Holland	40.0	Phone to Bandoeng
4.88	61,500	W1XAV	Chicopee Falls, Mass.	0.5	Exp.	16.36	18,340	ZLW	Wellington, New Zealand	....	Phone to VK2ME, irr.
4.96	60,500	....	Chicopee Falls, Mass.	0.5	Exp.	16.38	18,310	FZS	Saigon, French Indo-China	15.0	Phone to Ste. Assise
5.41	55,500	W3XKA	Philadelphia, Pa.	....	Exp.; relays KYW	16.36	18,340	WLA	Lawrenceville, N. J.	20.0	Phone to GAS
5.41	55,500	W8XKA	Pittsburgh, Pa.	....	Exp.; relays KDKA	16.39	18,304	GAS	Rugby, England	....	Phone to WLA
6.06	49,500	KGXK	Waikiki, T. H.	0.2	Phone	16.40	18,296	YVR	Maracay, Venezuela	....	Tests with DFB
6.20	48,400	KGXH	Ulupalakua, T. H.	0.2	Phone	16.42	18,270	ETA	Addis Ababa, Ethiopia	3.5	Phone; oec. bc.
6.34	47,300	KGXB	Manawahua, T. H.	0.2	Phone	16.44	18,240	FRO-FRE	Ste. Assise, France	30.0	Phone
6.49	46,200	KGXO	Kalepa, T. H.	0.2	Phone	16.46	18,220	KUS	Manila, P. I.	10.0	Phone
7.25	41,400	LQK	Monte Grande, Argentina	0.1	Exp.	16.48	18,200	GAW	Rugby, England	15.0	Phone
7.31	41,040	LQL	Monte Grande, Argentina	0.1	Exp.	16.49	18,190	JVB	Nazaki, Japan	10.0	Phone to Java, P. I.; bc
7.32	41,000	W8XH	Buffalo, N. Y.	0.1	Exp.	16.50	18,180	CGA	Drummondville, Canada	....	Phone to Rugby
7.32	41,000	W2XDV	New York, N. Y.	....	Exp.	16.55	18,135	PMC	Bandoeng, Java	40.0	Phone; sometimes bc.
7.37	40,700	KGXJ	Ulupalakua, T. H.	0.2	Phone	16.56	18,115	LSY3	Buenos Aires, Argentina	10.0	Phone; sometimes bc.
7.40	40,600	W10XFZ	Los Angeles, Calif.	0.1	Exp.	16.63	18,040	KQR	Bolinas, Calif.	40.0	Phone
7.58	39,600	KGXA	Manawahua, T. H.	0.2	Phone	16.65	18,020	KQJ	Bolinas, Calif.	40.0	Transpacific phone
7.60	39,473	TY4	La Turbie, France	0.1	Exp.	16.67	18,000	KQG	Bolinas, Calif.	40.0	Phone
7.77	38,600	....	Chicopee Falls, Mass.	0.5	Exp.	16.69	17,980	KQZ	Bolinas, Calif.	40.0	Phone
7.77	38,600	W8XH	Buffalo, N. Y.	0.1	Exp.	16.72	17,940	WQB	Rocky Point, N. Y.	40.0	Phone
7.77	38,600	W2XDV	New York, N. Y.	....	Exp.; relays WABC	16.74	17,920	WQF	Rocky Point, N. Y.	40.0	Phone
8.02	37,400	KGXC	Manawahua, T. H.	0.2	Phone	16.76	17,900	WLL	Rocky Point, N. Y.	20.0	Phone
9.30	36,144	TYZ	Calenzana, France	0.1	Exp.	16.79	17,870	OEY	Vienna, Austria	....	Phone
8.43	35,600	W8XH	Buffalo, N. Y.	0.1	Exp.	16.85	17,800	PCV	Kootwijk, Holland	40.0	Phone to Java
8.43	35,600	....	Chicopee Falls, Mass.	0.5	Exp.	16.86	17,790	XGBB	Shanghai, China	....	Phone
8.43	35,600	W2XDV	New York, N. Y.	....	Exp.; relays WABC	16.85	17,790	GSQ	Daventry, England	15.0	Broadcast
8.43	35,600	W6XKG	Los Angeles, Calif.	....	Exp.; relays KGFJ	16.87	17,780	W3XAL	Bound Brook, N. J.	15.0	Broadcast
8.67	34,600	W10XFZ	Los Angeles, Calif.	0.1	Exp.	16.87	17,780	W9XAA	Chicago, Ill.	0.5	Exp.
9.50	31,600	....	Chicopee Falls, Mass.	0.5	Exp.	16.87	17,780	W8XK	Pittsburgh, Pa.	40.0	Bc.; relays KDKA
9.50	31,600	W9XPD	St. Louis, Mo.	0.1	Exp.; relays KSD	16.88	17,775	PHI	Huizen, Holland	23.6	Broadcast
9.50	31,600	W2XDV	New York, N. Y.	....	Exp.; relays WABC	16.89	17,760	DJE	Zeesen, Germany	8.0	Broadcast
9.50	31,600	W8XH	Buffalo, N. Y.	0.1	Exp.; relays WBCN	16.89	17,760	W2XE	Wayne, N. J.	....	Bc.; relays WABC
9.50	31,600	W8XAI	Rochester, N. Y.	....	Exp.; relays WHAM	16.90	17,750	IAC	Coltano, Italy	14.0	Phone; early mornings
9.50	31,600	W9XAZ	Milwaukee, Wis.	....	Exp.; relays WTMJ	16.91	17,740	HSP	Bangkok, Siam	20.0	Phone to JVG
9.50	31,600	W8XWJ	Detroit, Mich.	0.1	Exp.	17.00	17,640	GFWV	S.S. Mojestic	....	Phone
9.65	31,100	W10XFZ	Los Angeles, Calif.	0.1	Exp.	17.00	17,640	GLSQ	S. S. Olympic	....	Phone
9.68	31,000	....	Chicopee Falls, Mass.	0.5	Exp.	17.00	17,640	GDLJ	S. S. Homerie	....	Phone
9.80	30,610	IAG	Golfo Aranci, Sardinia	....	Exp.	17.12	17,520	DFB	S. S. Monarch of Bermuda	....	Phone
10.06	29,820	IAG	Fiumicino, Italy	5.0	Exp.	17.12	17,520	DFB	S. S. Empress of Britain	....	Phone
11.49	26,100	GSK	Daventry, England	....	Broadcast	17.16	17,480	VWY	Nauen, Germany	7.2	Phone to YVR
13.45	22,300	GBU	Rugby, England	....	Phone	17.16	17,480	VWY	Kirkee, India	....	Phone to Rugby
13.92	21,550	XGBA	Shanghai, China	18.5	Broadcast	17.33	17,310	W3XAL	Bound Brook, N. J.	20.0	Exp.
13.93	21,540	W8XK	Pittsburgh, Pa.	40.0	Bc.; relays KDKA	17.33	17,310	CZA	Drummondville, Canada	4.0	Phone to ships
13.93	21,540	VK3LR	Lyndhurst, Victoria, Australia	0.6	Broadcast	17.34	17,300	VE9BY	London, Ont., Canada	....	Exp.; irr.
13.93	21,530	GSJ	Daventry, England	15.0	Broadcast	17.38	17,260	DAF	Norddeich, Germany	5.0	Phone
13.94	21,520	W2XE	Wayne, N. J.	....	Bc.; relays WABC	17.51	17,130	HAS5	Szekesfehervar, Hungary	20.0	Broadcast
13.97	21,470	GSH	Daventry, England	20.0	Broadcast	17.51	17,120	WOO	Ocean Gate, N. J.	20.0	Phone
13.98	21,460	W1XAL	Boston, Mass.	5.0	Broadcast	17.56	17,080	GBC	Rugby, England	5.0	Phone
14.01	21,420	WKK	Lawrenceville, N. J.	20.0	Phone to LSN	17.74	16,910	JZD	Nazaki, Japan	10.0	Phone to ships
14.19	21,140	KBI	Manila, P. I.	10.0	Phone	18.00	16,665	DAN	Norddeich, Germany	....	Tests with ships
14.20	21,130	LSM	Buenos Aires, Argentina	....	Phone, broadcast	18.07	16,600	DOAI	S. S. Europa	....	Phone to DAF & WOO
14.24	21,070	PSA	Marapicu, Brazil	10.0	Phone to WKK	18.23	16,460	DHEY	S. S. Deutschland	....	Phone to DAF & WOO
14.25	21,060	WKA	Lawrenceville, N. J.	20.0	Phone to England	18.37	16,330	VLC	Sydney, Australia	16.0	Phone
14.25	21,060	KWN	Dixon, Calif.	20.0	Phone	18.44	16,270	WLK	Kootwijk, Holland	....	Phone to Bandoeng
14.27	21,020	LSN	Hurlingham, Argentina	....	Phone, broadcast	18.47	16,240	KTO	Lawrenceville, N. J.	20.0	Phone to Rugby
14.37	20,860	EHY	Madrid, Spain	7.5	Phone to Buenos Aires	18.50	16,214	FZK3	Manila, P. I.	40.0	Phone to Dixon
14.41	20,820	KSS	Bolinas, Calif.	40.0	Phone	18.55	16,162	PSA	Saigon, French Indo-China	15.0	Phone to Ste. Assise
14.44	20,780	KMM	Bolinas, Calif.	40.0	Phone	18.56	16,150	GBX	Marapicu, Brazil	10.0	Broadcast
14.47	20,730	LSY	Monte Grande, Argentina	10.0	Phone	18.61	16,120	IRY	Rugby, England	....	Phone to Sydney
14.51	20,680	LSX	Monte Grande, Argentina	12.0	Phone to U. S. A.; oec. bc.	18.71	16,030	KKP	Rome, Italy	20.0	Phone
14.51	20,680	LSN	Hurlingham, Argentina	....	Phone to Europe; oec. bc.	18.77	15,985	KQH	Kahuku, T. H.	40.0	Phone to KWO
14.56	20,610	PMB	Bandoeng, Java	60.0	Phone to PCK	18.81	15,950	PLG	Kahuku, T. H.	40.0	Phone
14.72	20,380	GBA	Rugby, England	15.0	Phone to ships & LSN	18.89	15,880	FTK	Bandoeng, Java	....	Phone; afternoons
14.90	20,140	DWG	Nauen, Germany	7.2	Phone	18.92	15,855	CEC	Ste. Assise, France	30.0	Phone to Saigon
14.92	20,100	WQY	Rocky Point, N. Y.	40.0	Phone	18.92	15,860	JVD	La Granja, Chile	0.8	Phone
14.97	20,040	OPL	Leopoldville, Belgian Congo	9.0	Phone to ORG. mornings	19.04	15,760	JYT	Nazaki, Japan	....	Phone to Shanghai
14.99	20,020	DHO	Nauen, Germany	7.2	Phone to S. America	19.05	15,750	JIA	Kemikawa-Cho, Japan	5.0	Bc.; exp.
15.02	19,980	KAX	Manila, P. I.	20.0	Phone to Calif.	19.13	15,680	JZA	Tyureki, Formosa	10.0	Phone to Nazaki
15.04	19,950	DIH	Nauen, Germany	7.2	Phone	19.16	15,660	JVE	Tanjoshi, Manchukuo	20.0	Phone to Nazaki
15.08	19,900	LSG	Monte Grande, Argentina	7.0	Phone	19.21	15,620	JVF	Nazaki, Japan	10.0	Phone to PLE, P.I.; oec. bc.
15.11	19,850	WMI	Deal, N. J.	....	Phone	19.35	15,505	CMA3	Havana, Cuba	....	Phone to KWU; oec. bc.
15.12	19,840	FTD	Ste. Assise, France	....	Phone	19.37	15,490	KEM	Bolinas, Calif.	40.0	Tests, irr.
15.14	19,820	WKN	Lawrenceville, N. J.	20.0	Phone to England	19.39	15,475	KKL	Bolinas, Calif.	40.0	Phone
15.21	19,720	EAQ	Madrid, Spain	10.0	Phone to Latin America	19.40	15,460	KKR	Bolinas, Calif.	40.0	Phone
15.24	19,680	CEC	La Granja, Chile	4.0	Phone to LSR, HJY	19.43	15,440	PRADO	Riobamba, Ecuador	....	Phone; bc.
15.31	19,600	LSF	Monte Grande, Argentina	7.0	Phone	19.44	15,430	KWE	Bolinas, Calif.	40.0	Phone
15.37	19,520	IRW	Rome, Italy	20.0	Phone to S. America	19.45	15,420	KWO	Dixon, Calif.	20.0	Phone to Hawaii and Manila
15.50	19,355	FTM	Ste. Assise, France	30.0	Phone	19.52	15,370	HAS3	Szekesfehervar, Hungary	20.0	Broadcast
15.51	19,345	PMA	Bandoeng, Java	40.0	Phone; sometimes bc.	19.53	15,360	DJT	Zeesen, Germany	....	Exp.
15.58	19,260	PPU	Sepetiba, Brazil	13.5	Phone to Ste. Assise	19.54	15,355	KWU	Dixon, Calif.	20.0	Phone to Hawaii
15.61	19,220	WKF	Lawrenceville, N. J.	20.0	Phone to England	19.56	15,340	DJR	Zeesen, Germany	50.0	Broadcast
15.62	19,200	ORG	Ruyssede, Belgium	8.0	Phone	19.56	15,340	CTIAA	Liabon, Portugal	2.0	Broadcast
15.75	19,050	JVC	Nazaki, Japan	....	Phone; sometimes bc.	19.57	15,330	W2XAD	Schenectady, N. Y.	20.0	Broadcast; relays WGY
15.77	19,020	WKW-	Nazaki, Japan	....	Phone; sometimes bc.	19.60	15,310	GSP	Daventry, England	....	Broadcast
15.83	18,950	HBH	Rocky Point, N. Y.	....	Exp., mornings	19.61	15,300	OXY	Skamlebaek, Denmark	....	Exp.
15.86	18,910	JVA	Prangins, Switzerland	20.0	Phone	19.60	15,300	CP7	La Paz, Bolivia	1.0	Phone
15.87	18,900	WDS	Nazaki, Japan	20.0	Phone to Europe; oec. bc.	19.62	15,290	LUR	Buenos Aires, Argentina	7.5	Bc.; relays LRI
15.88	18,890	ZSS	Rocky Point, N. Y.	....	Phone	19.63	15,280	DJQ	Zeesen, Germany	50.0	Broadcast
15.91	18,860	WKM	Rocky Point, N. Y.	....	Phone	19.65	15,270	W2XE	Wayne, N. J.	15.0	Broadcast; relays WABC
15.93	18,830	PLE	Bandoeng, Java	40.0	Phone to Dixon & Nazaki	19.66	15,260	GSI	Daventry, England	15.0	Broadcast
16.08	18,670	OCI	Lima, Peru	....	Phone	19.67	15,250	RIM	Tashkent, U. S. S. R.	....	Phone
16.11	18,620	GAU	Rugby, England	15.0	Phone to WMI, VWY	19.67	15,250	W1XAL	Boston, Mass.	5.0	Broadcast
16.11	18,620	GBJ	Bodmin, England	....	Phone to Montreal	19.68	15,243	FYA	Pontoise, France	12.0	Broadcast
16.13	18,600	PDM	Kootwijk, Holland	40.0	Phone	19.71	15,220	PCJ	Huizen, Holland	20.0	Exp.
16.18	18,545	PCM	Kootwijk, Holland	40.0	Phone	19.72	15,210	W8XK	Pittsburgh, Pa.	40.0	Bc.; relays KDKA
						19.74	15,200	DJB	Zeesen, Germany	8.0	Broadcast
						19.75	15,190	VE9BA	Montreal, Que.	....	Broadcast
						19.76	15,180	GSO	Daventry, England	....	Broadcast

19.81	15,140	GSF	Daventry, England	15.0	Broadcast	25.38	11,820	GSN	Daventry, England	....	Broadcast
19.82	15,130	VE9DN	Montreal, Que.	....	Broadcast	25.40	11,810	I2R04	Rome, Italy	9.0	Broadcast
19.84	15,123	HVJ	Rome, Italy	10.0	Broadcast	25.40	11,810	CRCX	Toronto, Canada	0.5	Broadcast
19.85	15,110	DJL	Zeesen, Germany	5.0	Broadcast	25.42	11,801	OEK3	Vienna, Austria	0.25	Broadcast
19.86	15,104	RAU	Tashkent, U. S. S. R.	20.0	Phone	25.42	11,800	CO9WR	Sancti Spiritus, Cuba	0.15	Broadcast
19.91	15,070	PSD	Maripicu, Brazil	12.0	Phone	25.43	11,795	DJO	Zeesen, Germany	50.0	Exp.
19.93	15,055	WNC	Hialeah, Florida	0.4	Phone	25.45	11,790	HH2T	Port-au-Prince, Haiti	0.1	Tests, irr.
19.95	15,040	RKI	Moscow, U. S. S. R.	20.0	Phone to WQG, mornings	25.45	11,790	TITR	San Jose, Costa Rica	....	Broadcast
20.00	15,000	WWV	Beltsville, Md.	1.0	Freq. standard	25.45	11,790	W1XAL	Boston, Mass.	0.5	Broadcast
20.03	14,980	KAY	Manila, P. I.	40.0	Phone to Dixon	25.46	11,780	VE9DN	Montreal, Canada	....	Broadcast
20.08	14,940	HJA3	Barranquilla, Colombia	....	Phone to Colombia, Panama, Costa Rica	25.49	11,770	VE9DR	Montreal, Canada	....	Exp.
20.09	14,930	HJB	Bogota, Colombia	....	Phone	25.51	11,760	DJD	Zeesen, Germany	8.0	Broadcast
20.12	14,910	JVG	Nazaki, Japan	10.0	Phone to Formosa; also bc.	25.53	11,750	XDA	Mexico, D. F., Mexico	....	Exp.
20.23	14,830	WKU-W2XBJ	Rocky Point, N. Y.	40.0	Tests, daytime	25.53	11,750	GSD	Daventry, England	20.0	Broadcast
20.55	14,600	JVH	Nazaki, Japan	....	Phone to Europe; bc. to N. America & Hawaii	25.58	11,730	CJRX	Winnipeg, Canada	2.0	Bc.; relays CJRC
20.56	14,590	WMN	Lawrenceville, N. J.	20.0	Phone to England; daylight	25.57	11,730	PHI	Huizen, Holland	23.6	Bc., winter months
20.64	14,535	HBJ	Prangins, Switzerland	20.0	Phone	25.60	11,720	FYA	Pontoise, France	12.0	Broadcast
20.65	14,530	LSN	Hurlingham, Argentina	....	Phone	25.63	11,710	HJ4ABA	Medellin, Colombia	0.1	Broadcast
20.69	14,500	HPF	Panama City, Panama	0.25	Phone to WNC	25.68	11,680	KIO	Kahuku, T. H.	40.0	Phone to Bolinas
20.69	14,500	TGF	Guatemala City, Guat.	....	Phone to WNC	25.65	11,695	YV2RC	Caracas, Venezuela	1.0	Broadcast
20.69	14,500	TIN	Cartago, Costa Rica	....	Phone to WNC	25.71	11,670	PPQ	Sepetiba, Brazil	5.0	Exp.; irr., evenings
20.72	14,480	LSN	Hurlingham, Argentina	....	Phone, irr.	25.73	11,660	JVL	Nazaki, Japan	10.0	Phone to Formosa; bc.
20.72	14,480	YNA	Managua, Nicaragua	....	Phone to WNC	25.88	11,595	VRR4	Stony Hill, Jamaica	....	....
20.75	14,460	DZH	Zeesen, Germany	....	Exp.	26.10	11,495	VIZ3	Fiskville, Australia	....	Phone to Drummondville
20.78	14,440	GBW	Rugby, England	15.0	Phone to WNC	26.00	11,540	XGR	Shanghai, China	20.0	Phone
20.83	14,410	DIP	Zeesen, Germany	7.2	Exp.	26.11	11,490	GBK	Bodmin, England	....	Phone
21.25	14,120	HJ5ABE	Cali, Colombia	....	Broadcast	26.15	11,470	IBDK	S. S. Elettra, Marconi's Yacht	....	Exp.
21.54	13,950	YOI	Bucharest, Roumania	....	Broadcast	26.46	11,340	DAN	Norden, Germany	....	Time signals; 7 a.m., 7 p.m.
21.58	13,900	WQP	Rocky Point, N. Y.	....	Phone to RNE	26.80	11,187	XAM	Merida, Yucatan	....	Phone
21.63	13,870	WIY	Rocky Point, N. Y.	....	Tests, irr.	26.83	11,180	CT3AQ	Funchal, Madeira	0.05	Broadcast
21.72	13,811	SUZ	Abu Zabal, Egypt	10.0	Phone	27.17	11,040	HRW	Tegucigalpa, Honduras	....	Tests with HRY
21.82	13,740	KKW	Bolinas, Calif.	....	Phone	27.27	11,000	PLP	Bandoeng, Java	3.0	Phone; occ. bc.
21.82	13,740	CGA	Drummondville, Que.	....	Phone	27.27	11,000	XBJQ	Mexico, D. F., Mexico	....	Phone; works Hams, irr.
21.91	13,690	KKZ	Bolinas, Calif.	40.0	Phone	27.30	10,990	ZLT	Wellington, N. Z.	....	Phone to Australia, mornings
21.92	13,685	HAT	Szekefsehervar, Hungary	20.0	Broadcast	27.50	10,910	KTR	Manila, P. I.	20.0	Phone
22.00	13,635	SPW	Warsaw, Poland	20.0	Broadcast	27.63	10,850	DFL	Nauen, Germany	....	Phone
22.04	13,610	JYK	Kemikawa-Cho, Japan	....	Bc. and tests	27.68	10,840	KWV	Dixon, Calif.	20.0	Phone to Hawaii
22.08	13,591	GBC	Rugby, England	....	Phone to CGA & ships	27.88	10,770	GBP	Rugby, England	15.0	Phone
22.08	13,585	GBB	Rugby, England	15.0	Phone	27.93	10,740	JVM	Nazaki, Japan	20.0	Phone to U. S. A.; bc.; relays JOAK
22.12	13,560	JVI	Nazaki, Japan	10.0	Phone to Manchukuo; bc.	28.10	10,675	WNB	Lawrenceville, N. J.	0.5	Phone to Bermuda
22.36	13,420	TIEP	San Jose, Costa Rica	....	Broadcast	28.12	10,670	CEC	La Granja, Chile	4.0	Phone; also bc.
22.40	13,390	WMA	Lawrenceville, N. J.	20.0	Phone	28.14	10,660	JVN	Nazaki, Japan	20.0	Bc.; relays JOAK; phone
22.47	13,350	YVQ	Maracay, Venezuela	20.0	Phone	28.25	10,620	WEF	Rocky Point, N. Y.	40.0	Phone to Europe
22.49	13,340	CGA	Drummondville, Canada	....	Phone	28.28	10,610	WEA	Rocky Point, N. Y.	40.0	Exp.
22.58	13,285	CGA3	Drummondville, Canada	15.0	Phone to ships	28.36	10,578	FYB	Paris, France	....	Time signals; 5:26 a.m., 6:26 p.m.
22.66	13,240	KBJ	Manila, P. I.	40.0	Phone	28.44	10,550	WOK	Lawrenceville, N. J.	20.0	Phone
22.68	13,220	GFVW	S. S. Majestic	....	Phone	28.48	10,535	JIB	Tyureki, Formosa	6.0	Phone to Japan
		GLSQ	S. S. Olympic	....	Phone	28.50	10,525	VLK	Sydney, Australia	....	Phone
		GDLJ	S. S. Homeric	....	Phone	28.76	10,430	YBG	Medan, Sumatra	3.0	Phone; occ. bc.
		GTSD	S. S. Monarch of Bermuda	....	Phone	28.79	10,420	XGW	Shanghai, China	20.0	Phone
		GMBJ	S. S. Empress of Britain	....	Phone	28.82	10,410	PDK	Kootwijk, Holland	60.0	Phone
		GLRZ	S. S. Aquitania	....	Phone	28.82	10,410	LSY	Monte Grande, Argentina	10.0	Phone
		GBZW	S. S. Berengaria	....	Phone	28.82	10,410	KES	Bolinas, Calif.	40.0	Phone
22.71	13,210	FNSK	S. S. Normandie	....	Phone	28.85	10,400	KEZ	Dixon, Calif.	40.0	Phone
22.83	13,140	CWH	Cerrito, Uruguay	1.5	Phone	28.87	10,390	KER	Bolinas, Calif.	40.0	Phone
22.89	13,105	IRJ	Rome, Italy	20.0	Phone	28.87	10,390	GBX	Rugby, England	....	Phone
22.93	13,075	VP1A	Suva, Fiji Islands	....	Broadcast	28.90	10,380	WCG	Rocky Point, N. Y.	40.0	Phone; Exp.
22.93	13,075	IBEJ	S. S. Conte Rosso	....	Phone	28.92	10,375	JVO	Nazaki, Japan	10.0	Phone to Manchukuo; also bc.
22.99	13,050	IBGI	S. S. Conte Verde	....	Phone	28.98	10,350	LSX	Monte Grande, Argentina	12.0	Phone
		IBLI	S. S. Conte di Savoia	....	Phone	29.03	10,335	ZFD	St. George, Bermuda	1.5	Phone; mostly telegraph
		ICEJ	S. S. Rex	....	Phone	29.03	10,330	ORK	Ruyselede, Belgium	11.0	Broadcast
23.00	13,040	DOAI	S. S. Europa	....	Phone	29.13	10,300	LSL2	Hurlingham, Argentina	5.0	Phone to Europe
		DOAH	S. S. Bremen	....	Phone	29.16	10,290	DZC	Nauen, Germany	....	Exp.
		DDBR	S. S. Berlin	....	Phone	29.15	10,290	HPC	Panama City, Panama	....	Phone
		DDCP	S. S. Cap Polonio	....	Phone	29.24	10,260	PMN	Bandoeng, Java	3.0	Phone; occ. bc.
		DHEY	S. S. Deutschland	....	Phone	29.34	10,220	PSH	Maripicu, Brazil	12.0	Phone
		DHJZ	S. S. Hamburg	....	Phone	29.48	10,170	RIO	Baku, U. S. S. R.	....	Phone
		DHDL	S. S. Cap Arcona	....	Phone	29.50	10,163	DOAI	S. S. Europa	....	Phone
		DHRL	S. S. New York	....	Phone			DOAH	S. S. Bremen	....	Phone
		DDFF	S. S. Reliance	....	Phone			DDBR	S. S. Berlin	....	Phone
		DDFT	S. S. Oceana	....	Phone			DDCP	S. S. Cap Polonio	....	Phone
23.04	13,020	JZE	Nazaki, Japan	10.0	Phone to ships			DHEY	S. S. Deutschland	....	Phone
23.36	12,840	WOO	Ocean Gate, N. J.	20.0	Phone to ships			DHJZ	S. S. Hamburg	....	Phone
23.38	12,830	CNR	Rabat, Morocco	12.0	Bc., Sundays			DHDL	S. S. Cap Arcona	....	Phone
23.44	12,795	IAC	Coltano, Italy	52.0	Phone			DHRL	S. S. New York	....	Phone
23.47	12,780	GBC	Rugby, England	5.0	Phone			DDFF	S. S. Reliance	....	Phone
23.54	12,745	DAF	Norddeich, Germany	5.0	Phone to ships			DDFT	S. S. Oceana	....	Phone
23.66	12,680	YNE	Puerto Cabezas, Nic.	....	Tests	29.59	10,140	OPM	Leopoldville, Belgian Congo	15.0	Phone to ORK
24.20	12,396	CTIGO	Paredo, Portugal	7.0	Broadcast	29.76	10,080	RIR	Tiflis, U. S. S. R.	10.0	Phone to RIO & RNE
24.38	12,300	ZLW	Wellington, N. Z.	....	Phone	29.79	10,070	EHY	Madrid, Spain	10.0	Exp.
24.40	12,295	ZLT	Wellington, N. Z.	1.0	Phone to Australia	29.81	10,065	JZB (TDE)	Kanjoshi, Manchukuo	20.0	Phone to JVO
24.41	12,290	GBU	Rugby, England	15.0	Phone	29.84	10,055	ZFB	St. George, Bermuda	1.5	Phone to WNB, day
24.45	12,270	RKK	Moscow, U. S. S. R.	20.0	Phone	29.84	10,055	SUV	Abu Zabal, Egypt	10.0	Phone to GAA
24.47	12,260	FTN	Ste. Assise, France	30.0	Phone	29.88	10,042	DZB (DJJ)	Zeesen, Germany	....	Exp.
24.49	12,250	TYB	Pontoise, France	....	Phone to JVH & ships	30.00	10,000	WWV	Beltsville, Md.	....	Standard frequency
24.49	12,250	GBS	Rugby, England	....	Phone	30.01	9,990	KAZ	Manila, P. I.	40.0	Phone to FLV, mornings
24.52	12,235	TFJ	Reykjavik, Iceland	....	Broadcast			LSL	Hurlingham, Argentina	....	Phone
24.56	12,215	TYA	Paris, France	15.0	Phone	30.09	9,964	IRS	Rome, Italy	15.0	Phone
24.61	12,190	YBJ	Medan, Sumatra	2.5	Phone	30.12	9,960	GCU	Rugby, England	15.0	Phone to U. S. A.
24.69	12,150	FQO, FQE	Ste. Assise, France	....	Phone to U. S. A.	30.21	9,930	YBF	Medan, Sumatra	1.0	Phone
24.69	12,150	GBS	Rugby, England	15.0	Phone	30.21	9,930	HJY	Bogota, Colombia	....	Phone to OCI, CEC
24.73	12,130	DZS	Zeesen, Germany	....	Phone	30.23	9,925	JDY	Dairen, Manchuria	....	Phone to Nazaki
24.73	12,130	DZE	Zeesen, Germany	....	Tests with VIY-VK3ME	30.26	9,905	CGA5	Drummondville, Canada	....	Tests with Rugby
24.79	12,100	CJA6	Drummondville, Canada	15.0	Broadcast	30.32	9,890	LSN2	Hurlingham, Argentina	5.0	Phone
24.83	12,082	CTICT	Lisbon, Portugal	0.5	Phone	30.40	9,870	WON	Lawrenceville, N. J.	20.0	Phone to England
24.88	12,060	PDV	Kootwijk, Holland	60.0	Exp.	30.43	9,860	EAQ	Madrid, Spain	20.0	Broadcast
24.93	12,035	DJK	Zeesen, Germany	7.2	Phone	30.49	9,840	FTI	Ste. Assise, France	15.0	Phone
24.94	12,030	HBO	Prangins, Switzerland	20.0	Tests with Drummondville	30.49	9,840	JYS	Kemikawa-Cho, Japan	10.0	Bc. and tests
24.96	12,020	VIY-VK3ME	Melbourne, Australia	....	Phone	30.50	9,830	LSI	Buenos Aires, Argentina	10.0	Phone
25.00	12,000	RW59	Moscow, U. S. S. R.	20.0	Broadcast	30.52	9,830	IRM	Rome, Italy	25.0	Phone
25.02	11,991	FZS2	Saigon, French Indo-China	15.0	Phone to FTK	30.61	9,800	GCW	Rugby, England	15.0	Phone
25.09	11,955	ETB	Addis Ababa, Ethiopia	3.5	Phone, c.w., bc.	30.74	9,760	VLJ	Sydney, Australia	3.5	Phone
25.11	11,950	KKQ	Bolinas, Calif.	40.0	Phone	30.77	9,750	WOF	Lawrenceville, N. J.	20.0	Phone
25.11	11,950	FTA	Ste. Assise, France	30.0	Phone to Saigon	30.90	9,710	GCA	Rugby, England	15.0	Phone
25.26	11,880	FYA	Pontoise, France	....	Broadcast	31.00	9,677	CTICT	Lisbon, Portugal	0.5	Broadcast
25.26	11,880	W9XF	Chicago, Ill.	....	Bc.; relays WENR	31.01	9,675	DZA (DJI)	Zeesen, Germany	....	Phone
25.27	11,870	W8XK	Pittsburgh, Pa.	40.0	Bc.; relays KDKA	31.06	9,660	CTIAA	Lisbon, Portugal	2.0	Broadcast
25.30	11,860	VE9CA	Calgary, Canada	....	Broadcast	31.12	9,640	YDB	Sourabaya, Java	1.0	Bc.; relays YDA
25.30	11,860	GSE	Daventry, England	20.0	Broadcast	31.12	9,640	HSP2	Bangkok, Siam	....	Broadcast
25.31	11,855	DJP	Zeesen, Germany	50.0	Broadcast	31.14	9,635	I2R03	Rome, Italy	20.0	Broadcast
25.34	11,840	KZRM	Manila, P. I.	6.0	Broadcast	31.18	9,620	DGU	Nauen, Germany	....	Phone to Egypt
25.36	11,835	CHNX	Halifax, N. S.	....	Broadcast	31.25	9,600	CB960	Santiago, Chile	0.1	Broadcast
25.36	11,830	W2XE	Wayne, N. J.	5.0	Bc.; relays WABC	31.25	9,600	XEFT	Veracruz, Mexico	0.02	Broadcast
25.36	11,830	W9XAA	Chicago,								

31.25	9,600	.....	Cartagena, Colombia	0.7		36.95	8,120	KTP	Manila, P. I.	40.0	Phone to Dixon, Calif.
31.27	9,595	HH3W	Port-au-Prince, Haiti	0.03	Broadcast	36.95	8,120	KAZ	Manila, P. I.	20.0	Phone to Dixon, Calif.
31.27	9,595	HBL	Geneva, Switzerland	18.0	Broadcast	37.14	8,075	TYB2	Paris, France	....	Phone
31.28	9,590	VK2ME	Sydney, Australia	20.0	Bc., Sundays	37.34	8,035	CNR	Rabat, Morocco	12.0	Bc., Sundays
31.28	9,590	PCJ	Huizen, Holland	20.0	Exp.; bc.	37.41	8,020	HSJ	Bangkok, Siam	20.0	Phone
31.28	9,590	HP5J	Panama, Panama	0.16	Broadcast	37.59	7,980	VLJ	Sydney, Australia	3.5	Phone to Java
31.28	9,590	W3XAU	Philadelphia, Pa.	1.0	Bc.; relays WCAU	37.69	7,960	VLZ	Sydney, Australia	3.5	Phone
31.31	9,580	GSC	Daventry, England	20.0	Broadcast	38.00	7,890	VPD	Suva, Fiji Islands	0.15	Phone
31.31	9,580	VE9DR	Montreal, Canada	....	Exp.	38.07	7,880	JYR	Kemikawa-Cho, Japan	5.0	Broadcast
31.31	9,580	VK3LR	Lyndhurst, Victoria, Australia	20.0	Broadcast	38.10	7,870	RXC	Panama City, Panama	....	Phone HJP, afternoons, irr.
31.31	9,580	LRX	Buenos Aires, Argentina	7.5	Bc.; relays LRI	38.13	7,867	SUX	Abu Zabal, Egypt	10.0	Phone
31.31	9,580	XGBD	Shanghai, China	18.5	Broadcast	38.20	7,854	HC2JSB	Guayaquil, Ecuador	0.5	Broadcast
31.35	9,570	W1XK	Millis, Mass.	10.0	Bc.; relays WBZ, WBZA	38.31	7,830	PGA	Kootwijk, Holland	60.0	Phone
31.36	9,565	VUY (VUB)	Bombay, India	4.5	Broadcast	38.48	7,797	HBP	Geneva, Switzerland	20.0	Broadcast
31.38	9,560	DJA	Zeesen, Germany	5.0	Broadcast	38.89	7,715	KEE	Bolinas, Calif.	40.0	Phone; relays programs to KGMB
31.40	9,555	VE9DN	Montreal, Canada	....	Broadcast	39.28	7,632	OEJ	Vienna, Austria	....	Phone
31.43	9,545	HH2R	Port-au-Prince, Haiti	0.1	Tests	39.32	7,630	ZHJ	Penang, F. M. S.	....	Broadcast
31.43	9,545	CEC	La Grana, Chile	4.0	Broadcast	39.34	7,626	RIM	Tashkent, U.S.S.R.	20.0	Phone to RKI
31.47	9,540	DJN	Zeesen, Germany	50.0	Broadcast	39.37	7,620	ETD	Addis Ababa, Ethiopia	3.5	Phone
31.47	9,540	CQN	Macao, Asia	0.5	Broadcast	39.42	7,610	KWX	Dixon, Calif.	20.0	Phone to Hawaii
31.47	9,540	CB954	Santiago, Chile	5.0	Broadcast	39.58	7,580	XGO	Shanghai, China	....	Tests; phone
31.48	9,530	W2XAF	Schenectady, N. Y.	40.0	Bc.; relays WGY	39.66	7,565	KWY	Dixon, Calif.	20.0	Phone
31.48	9,530	LKJ1	Jeloy, Norway	25.0	Exp.	39.68	7,560	EA8AB	Tenerife, Canary Islands	....	Broadcast
31.51	9,520	F3ICD	Saigon, French Indo-China	....	Phone	39.74	7,550	T18WS	Puntarenas, Costa Rica	0.12	Broadcast
31.51	9,520	XEDQ	Guadalajara, Mexico	....	Bc.; relays XED	39.88	7,522	HJA3	Barranquilla, Colombia	....	Phone
31.51	9,520	OXY	Skamlebaek, Denmark	0.5	Broadcast	39.89	7,520	KKH	Kahuku, T. H.	40.0	Phone
31.55	9,510	YV3RC	Caracas, Venezuela	0.25	Broadcast	39.95	7,510	JVP	Tokyo, Japan	20.0	Phone
31.55	9,510	GSB	Daventry, England	20.0	Broadcast	40.00	7,500	RKI	Moscow, U.S.S.R.	20.0	Phone to RIM
31.58	9,501	PRF5	Rio de Janeiro, Brazil	60.0	Broadcast	40.16	7,470	JVQ	Nazaki, Japan	10.0	Phone to Java, P. I.; also bc.
31.58	9,500	HJU	Buenaventura, Colombia	....	Broadcast	40.16	7,470	JVO	Nazaki, Japan	10.0	Phone to Java & P. I.
31.58	9,500	XG0X	Nanking, China	....	Broadcast	40.16	7,470	HJA3	Barranquilla, Colombia	....	Phone
31.58	9,500	HSP2	Bangkok, Siam	2.5	Broadcast	40.19	7,465	HJP	Bogota, Colombia	....	Bc.; phone to WNC, C. A. & Venez.
31.61	9,490	WEF	Rocky Point, N. Y.	40.0	Phone	40.27	7,450	HJC	Bogota, Colombia	....	Phone
31.61	9,490	VK3ME	Melbourne, Australia	5.0	Bc., Wed., Sat.	40.30	7,444	HBQ	Geneva, Switzerland	....	Broadcast
31.61	9,490	KEI	Bolinas, Calif.	20.0	Phone	40.30	7,444	HBQ	Geneva, Switzerland	....	Broadcast
31.65	9,480	KET	Bolinas, Calif.	40.0	Phone	40.45	7,415	WEG	Rocky Point, N. Y.	40.0	Phone
31.68	9,470	WET	Rocky Point, N. Y.	....	Exp.	40.50	7,407	WEN	Rocky Point, N. Y.	40.0	Phone
31.75	9,450	WES-W2XBJ	Rocky Point, N. Y.	40.0	Exp.	40.54	7,400	W2XBJ	Rocky Point, N. Y.	40.0	Phone; exp.
31.75	9,450	TG1X	Guatemala City, Guat.	....	Exp.	40.60	7,390	ZLT2	Bogota, Colombia	....	Phone to Quito
31.82	9,428	COCH	Havana, Cuba	0.4	Broadcast	40.65	7,380	XECR	Wellington, N. Z.	1.0	Phone to Sydney, mornings
31.86	9,415	PLV	Bandoeng, Java	80.0	Phone; sometimes bc.	40.71	7,370	KEQ	Mexico D. F., Mexico	20.0	Broadcast
31.92	9,400	XDC	Mexico City, Mexico	....	Exp.	40.71	7,370	KEQ	Kahuku, T. H.	40.0	Phone
32.00	9,375	XDA	Mexico D. F., Mexico	....	Phone	41.10	7,300	VK3ZX	Caulfield, Australia	....	Broadcast
32.15	9,332	CGA4	Drummondville, Canada	15.0	Phone to England	41.21	7,281	HJ1ABD	Cartagena, Colombia	....	Broadcast
32.27	9,300	YNGU	Managua, Nicaragua	....	Broadcast	41.55	7,220	VP3BG	Georgetown, Brit. Guiana	....	Broadcast
32.33	9,280	GCB	Rugby, England	15.0	Phone	41.55	7,220	HAT2	Szkesfehervar, Hungary	20.0	Broadcast
32.43	9,250	GBK	Bodmin, England	....	Phone to Drummondville	41.80	7,177	CR6AA	Lobita, Angola, Port W. Africa	0.5	Broadcast; phone, C. W.
32.72	9,170	WNA	Lawrenceville, N. J.	20.0	Phone to England	41.96	7,150	XICB	Mexico City, Mexico	....	Broadcast
32.76	9,168	YVR	Maraca, Venezuela	....	Phone to Europe	42.02	7,140	PZH	Paramaribo, Dutch Guiana	....	Broadcast
32.87	9,125	HAT4	Budapest, Hungary	20.0	Broadcast	42.02	7,140	OAR	Lima, Peru	....	Broadcast
32.89	9,120	CP6	La Paz, Bolivia	....	Broadcast	42.08	7,130	HKE	Bogota, Colombia	0.138	Broadcast
32.89	9,120	JBK	Kagoshima, Japan	....	Phone	42.13	7,120	....	Papeete, Tahiti	....	Broadcast
33.15	9,050	TFK	Reykjavik, Iceland	7.0	Broadcast	42.15	7,118	HB9B	Basle, Switzerland	....	Broadcast
33.19	9,037	TYA2	Pontoise, France	15.0	Phone to Algeria	42.25	7,100	HJ1ABE	Sinelejo, Colombia	0.1	Broadcast
33.26	9,020	GCS	England	15.0	Phone	42.25	7,100	HJ1ABG	Medellin, Colombia	....	Broadcast
33.30	9,010	KEJ	Bolinas, Calif.	40.0	Phone; relays programs for KGMB	42.31	7,090	SM5SD	Stockholm, Sweden	0.03	Broadcast
33.43	8,975	VWY	Kirkee, India	....	Phone to England, mornings	42.36	7,082	FIJ1	Dordrecht, Holland	....	Amateur; sometimes bc.
33.52	8,950	WEL-W2XBJ	Rocky Point, N. Y.	....	Exp.	42.37	7,080	VF3MR	Georgetown, Brit. Guiana	0.05	Amateur; bc.
33.60	8,930	WEC	Rocky Point, N. Y.	....	Exp.	42.37	7,080	LU5CZ	Buenos Aires, Argentina	....	Amateur; sometimes bc.
33.71	8,900	ZLT	Wellington, N. Z.	1.0	Phone to Sydney	42.46	7,074	HJ1ABK	Barranquilla, Colombia	....	Broadcast
33.82	8,870	NPO	Manila, P. I.	....	Time signals, 10 p. m.	42.74	7,020	EA125	Madrid, Spain	....	Broadcast
33.96	8,830	DDBR	S.S. Berlin	....	Phone	42.92	6,990	LKJ1	Jeloy, Norway	1.0	Broadcast
		DDCP	S.S. Cap Polonio	....	Phone	42.98	6,980	I2R02	Rome, Italy	9.0	Broadcast
		DDFF	S.S. Reliance	....	Phone	43.45	6,905	GDS	Rugby, England	15.0	Phone
		DDFT	S.S. Oceana	....	Phone	43.48	6,900	HI3C	La Romana, D. R.	....	Broadcast
		DHA0	S.S. Hansa	....	Phone	43.73	6,890	KEL	Bolinas, Calif.	40.0	Phone
		DHDL	S.S. Cap Arcona	....	Phone	43.86	6,840	CFA	Drummondville, Canada	....	Phone
		DHEY	S.S. Deutschland	....	Phone	44.05	6,810	HHI	San Pedro de Macoris, D.R.	....	Broadcast
		DHJZ	S.S. Hamburg	....	Phone	44.12	6,800	HCETC	Quito, Ecuador	0.03	Broadcast
		DHRL	S.S. New York	....	Phone	44.12	6,800	HI7P	Trujillo, D. R.	....	Broadcast
		DOAH	S.S. Bremen	....	Phone	44.41	6,755	WOA	Lawrenceville, N. J.	20.0	Phone
		DOAI	S.S. Europa	....	Phone	44.44	6,750	JVT	Nazaki, Japan	20.0	Phone to U. S. A.; bc. relays JOAK
		FNSK	S.S. Normandie	....	Phone	44.51	6,740	WEJ-W2XBJ	Rocky Point, N. Y.	....	Exp.
		FNSM	S.S. Paris	....	Phone	44.61	6,725	WQO	Rocky Point, N. Y.	....	Phone
		FNTQ	S.S. Ile de France	....	Phone	44.66	6,718	KBK	Manila, P. I.	40.0	Phone
		GBZW	S.S. Berengaria	....	Phone	44.71	6,710	TIEP	San Jose, Costa Rica	....	Broadcast
		GDJL	S.S. Homeric	....	Phone	44.71	6,710	KEF	Bolinas, Calif.	40.0	Phone
		GFVJ	S.S. Majestic	....	Phone	44.91	6,680	DGK	Nauen, Germany	....	Phone
		GLRZ	S.S. Aquitania	....	Phone	44.94	6,675	YV4RB	Caracas, Venezuela	....	Broadcast
		GMBJ	S.S. Empress of Britain	....	Phone	44.96	6,672	YVQ	Maraca, Venezuela	....	Phone
		VQJM	S.S. Monarch of Bermuda	....	Phone	45.00	6,667	HC2RL	Guayaquil, Ecuador	0.15	Broadcast
		VQJP	S.S. Queen of Bermuda	....	Phone	45.11	6,650	IAC	Coltano, Italy	14.0	Phone
34.00	8,823	YNVA	Managua, Nicaragua	....	Broadcast	45.11	6,650	TITE	San Jose, Costa Rica	....	Broadcast
34.14	8,790	HJA3	Barranquilla, Colombia	....	Phone	35.25	6,630	HIT	Trujillo, D. R.	....	....
34.14	8,790	TIR	Cartago, Costa Rica	....	Phone to TGA, HJB, WNC, afternoons	45.34	6,618	PRADO	Riohamba, Ecuador	....	Broadcast
34.18	8,775	HCJB	Quito, Ecuador	0.5	Broadcast	45.38	6,611	REN (RW72)	Moscow, U.S.S.R.	10.0	Bc.; phone
34.18	8,775	PNI	Makassar, Celebes	0.3	Phone; occ. bc.	45.46	6,600	XFA2	Veracruz, Mexico	....	Phone
34.21	8,770	RSZ	Irkutsk, U.S.S.R.	....	Phone	45.52	6,590	ZEB	Bulawayo, S. Rhodesia	0.5	Phone to ZEB
34.29	8,750	ZCK	Hong Kong, China	0.25	Bc.; relays ZBW	45.52	6,590	ZEA	Salisbury, S. Rhodesia	0.5	Phone to ZEB
34.44	8,710	KBB	Manila, P. I.	....	Phone	45.80	6,550	HI4D	Trujillo, D. R.	....	Broadcast
34.56	8,680	GBC	Rugby, England	5.0	Phone to ships	45.80	6,550	TIRCC	San Jose, Costa Rica	....	Broadcast
34.62	8,665	CO9JQ	Camaguey, Cuba	0.2	Broadcast	46.01	6,520	YV6RV	Valencia, Venezuela	....	Broadcast
34.80	8,620	VVD	Seattle, Wash.	....	Tests with Juneau, Alas.	46.03	6,510	HIL	Trujillo, D. R.	....	Broadcast
34.80	8,620	HKV	Bogota, Colombia	....	Broadcast	46.23	6,490	HJ5ABD	Cali, Colombia	0.25	Broadcast
34.88	8,600	YNVA	Managua, Nicaragua	....	Broadcast	46.50	6,451	HJ4ABC	Ibague, Colombia	....	Broadcast
35.00	8,570	RW15	Khabarovsk, Siberia	15.0	Broadcast	46.51	6,450	HI4V	Trujillo, D. R.	....	Broadcast
35.03	8,565	HAT3	Szkesfehervar, Hungary	20.0	Broadcast	46.51	6,450	HJ1ABB	Barranquilla, Colombia	0.1	Broadcast
35.05	8,560	WOO	Ocean Gate, N. J.	20.0	Phone to ships, irr.	46.51	6,450	YN1GG	Managua, Nicaragua	0.1	Broadcast
35.29	8,500	JZF	Nazaki, Japan	10.0	Phone to ships	46.66	6,430	HI1S	Puerto Plato, D. R.	0.045	Broadcast
35.42	8,470	DAF	Norddeich, Germany	....	Phone to ships	46.69	6,425	VE9AS	Fredericton, N. B., Canada	....	Broadcast
35.73	8,404	HC2CW	Guayaquil, Ecuador	....	Broadcast	46.69	6,425	W9XBS	Chicago, Ill.	2.5	Exp.
35.80	8,380	IAC	Coltano, Italy	14.0	Phone	46.69	6,425	VE9BY	London, Ont., Canada	....	Broadcast
36.00	8,328	DOAI	S.S. Europa	....	Phone	46.69	6,425	W3XL	Bound Brook, N. J.	18.0	Exp.
		DOAH	S.S. Bremen	....	Phone	46.76	6,416	HJA3	Barranquilla, Colombia	....	Phone
		DDBR	S.S. Berlin	....	Phone	46.80	6,410	TIPG	San Jose, Costa Rica	1.0	Broadcast
		DDCP	S.S. Cap Polonio	....	Phone	46.87	6,400	YV9RC	El Valle, Venezuela	....	Broadcast
		DHEY	S.S. Deutschland	....	Phone	47.00	6,383	HI3U	Santiago, D. R.	0.025	Broadcast
		DHJZ	S.S. Hamburg	....	Phone	47.06	6,375	YV4RC	Caracas, Venezuela	0.1	Broadcast
		DHDL	S.S. Cap Arcona	....	Phone	47.17	6,360	TIFA	San Jose, Costa Rica	....	Broadcast
		DHRL	S.S. New York	....	Phone	47.19	6,357	HRP1	San Pedro Sula, Honduras	....	Broadcast
		DDFF	S.S. Reliance	....	Phone	47.24	6,350	HRV	Tela, Honduras	....	Tests with HRW
		DDFT	S.S. Oceana	....	Phone	47.39	6,330	YV13RV	Valencia, Venezuela	....	Broadcast
		DHA0	S.S. Hansa	....	Phone	47.39	6,330	JZG	Nazaki, Japan	10.0	Phone to ships
36.50	8,220	ZP10	Asuncion, Paraguay	0.015	Broadcast	47.51	6,315	HI2	Trujillo, D. R.	0.02	Broadcast
36.56	8,205	XEMB	Merida, Yucatan, Mexico	....	Broadcast	47.54	6,310	HP5K	Colon, Panama	....	Broadcast
36.63	8,190	XEME	Merida, Yucatan, Mexico	....	Bc.; relays XEFC	47.62	6,300	YV12RM	Maraca, Venezuela	....	Broadcast

47.77	6,280	HIG	Trujillo, D. R.	....	Broadcast	51.46	5,830	CWD	Montevideo, Uruguay	1.5	Phone
47.85	6,270	CO9WR	Sancti Spiritus, Cuba	....	Broadcast	51.50	5,825	HJA2	Bogota, Colombia	....	Phone
48.00	6,250	OCI	Lima, Peru	....	Phone	51.50	5,825	KZGG	Cebu, Isl of Cebu, P. I.	....	Phone
48.09	6,240	HRV	La Ceiba, Honduras	....	Broadcast	51.50	5,825	WQN	Rocky Point, N. Y.	40.0	Exp.
48.15	6,230	OAX4G	Lima, Peru	....	Broadcast	51.52	5,823	TIGPH	San Jose, Costa Rica	....	Broadcast
48.19	6,225	HJ1ABH	Cienaga, Colombia	....	Broadcast	51.63	5,810	YV7RMO	Maracaibo, Venezuela	....	Broadcast
48.23	6,220	HJ2ABA	Tunja, Colombia	....	Broadcast	51.72	5,800	KZGF	Manila, P. I.	....	Phone; occ. bc.
48.40	6,198	CTIGO	Paredo, Portugal	0.7	Broadcast	51.72	5,800	YV2RC	Caracas, Venezuela	1.0	Broadcast
48.50	6,185	H1IA	Santiago de los Caballeros, D. R.	0.05	Broadcast	51.77	5,795	KZGH	Iloilo, P. I.	....	Inter-island phone
48.54	6,180	HJ3ABF	Bogota, Colombia	0.1	Broadcast	51.81	5,790	JVU	Nazaki, Japan	10.0	Phone to Manchukuo, also bc. to JZA-B-C
84.54	6,180	XEXA	Mexico City, Mexico	....	Broadcast	51.90	5,780	CMB2	Havana, Cuba	....	Tests with Riverhead
48.70	6,160	CJRO	Winnipeg, Man., Canada	....	Bc.; relays CJRC	51.90	5,780	OAX4D	Lima, Peru	20.0	Broadcast
48.78	6,150	COKG	Santiago, Cuba	2.4	Bc.; relays CMKB	52.08	5,760	HJ4ABD	Medellin, Colombia	....	Broadcast
48.78	6,150	CB615	Santiago, Chile	0.15	Broadcast	52.26	5,740	TGS	Guatemala City, Guat.	0.2	Broadcast
48.78	6,150	YV3RC	Caracas, Venezuela	0.25	Broadcast	52.36	5,730	JVV	Nazaki, Japan	10.0	Phone to Formosa; bc.
48.78	6,150	HJ5ABC	Cali, Colombia	0.1	Broadcast	52.45	5,720	YV1ORSC	San Cristobal, Venezuela	....	Broadcast
48.78	6,150	H15M	Santiago de los Caballeros, D. R.	....	Broadcast	52.54	5,710	JDZ	Dairen, Manchuria	....	Phone to Nazaki
48.78	6,150	VE9CL	Winnipeg, Man., Canada	....	Broadcast	52.58	5,705	CFU	Roseland, B. C., Canada	....	Phone; bc.
48.78	6,150	CSL	Lisbon, Portugal	....	Broadcast	53.00	5,660	CFD	Kenora, Ont., Canada	0.15	Phone
48.78	6,150	H15N	Trujillo, D. R.	....	Broadcast	53.00	5,660	CFN	Slate Creek, B. C., Canada	....	Phone
48.86	6,140	KZRM	Manila, P. I.	6.0	Broadcast	53.00	5,660	CFJ	Red Lake, Ont., Canada	....	Phone
48.86	6,140	W8XK	Pittsburgh, Pa.	40.0	Bc.; relays KDKA	54.05	5,550	XQAJ	Shanghai, China	....	Broadcast
48.89	6,136	CR7AA	Lourenzo Marques, Mozambique	....	Broadcast	54.15	5,540	VXV	Rome, Italy	....	Broadcast
48.92	6,132	ZGE	Kuala Lumpur, F. M. S.	0.18	Broadcast	54.15	5,540	VXU	Hudson Bay Junction, Sask., Canada	....	Phone
48.94	6,130	VE9BA	Montreal, Canada	....	Broadcast	54.30	5,525	T15HH	Regina, Sask., Canada	....	Phone
48.94	6,130	COCD	Havana, Cuba	0.2	Bc.; relays CMCD	54.64	5,490	ROI	San Ramon, Costa Rica	0.2	Broadcast
48.94	6,130	H16Z	Trujillo, D. R.	....	Broadcast	55.15	5,440	RSN	Sverdlovsk, U.S.S.R.	15.0	Phone
48.94	6,130	LKJ1	Jeloy, Norway	1.0	Broadcast	55.19	5,435	LSH	Sverdlovsk, U.S.S.R.	10.0	Phone
48.94	6,130	TGXA	Guatemala City, Guat.	0.02	Broadcast	55.40	5,415	IAF	Monte Grande, Argentina	....	Phone
48.96	6,128	YV11RMO	Maracaibo, Venezuela	....	Broadcast	55.45	5,410	ZCK	Fiumicino, Italy	5.0	Phone
49.02	6,120	XEFT	Vera Cruz, Mexico	0.02	Broadcast	55.50	5,405	VXX	Hong-Kong, China	....	Bc.; relays ZBW
49.02	6,120	VE9HK	Halifax, N. S., Canada	....	Broadcast	55.56	5,400	CGP	Sage Creek, B. C., Canada	....	Phone
49.02	6,120	ZEB	Bulawayo, S. Rhodesia	....	Phone	55.56	5,400	CZQ	Prince Rupert, B. C., Canada	....	Phone
49.02	6,120	W2XE	Wayne, N. J.	5.0	Bc.; relays WABC	55.56	5,400	HJA7	Anyox, B. C., Canada	....	Phone
49.02	6,120	YDA5	Bandoeng, Java	1.5	Broadcast	55.56	5,400	HAT	Cucuta, Colombia	0.4	Phone
49.06	6,115	HJ1ABE	Cartagena, Colombia	0.05	Broadcast	55.56	5,400	RSB	Budapest, Hungary	20.0	Broadcast
49.10	6,110	CHNX	Halifax, N. S., Canada	0.2	Bc.; relays CHNS	55.81	5,375	ZFO	Stalinsk, U. S. S. R.	2.0	Phone
49.10	6,110	HJ4ABB	Manizales, Colombia	....	Broadcast	56.60	5,300	ZFO	Cat Cay, Bahamas	0.05	Phone
49.10	6,110	GSL	Daventry, England	....	Broadcast	57.03	5,260	YDU3	Medan, Sumatra	....	Broadcast
49.10	6,110	VUC	Calcutta, India	0.5	Broadcast	58.03	5,170	PNY	Bandoeng, Java	2.0	Broadcast
49.10	6,110	VE9CG	Calgary, Alberta, Canada	....	Broadcast	58.71	5,110	KIKB	Bolinas, Calif.	40.0	Phone
49.18	6,100	WuXF	Chicago, Ill.	5.0	Bc.; relays WENR	58.76	5,105	KEC	Bolinas, Calif.	40.0	Phone
49.18	6,100	W3XAL	Bound Brook, N. J.	35.0	Bc.; relays WJZ	58.94	5,090	TFL	Reykjavik, Iceland	....	Broadcast
49.18	6,100	VE9CF	Halifax, N. S., Canada	....	Broadcast	59.10	5,077	WCN	Lawrenceville, N. J.	20.0	Phone to England
49.20	6,098	ZTJ	Johannesburg, S. Africa	5.0	Broadcast	59.54	5,040	RIR	Tiflis, U. S. S. R.	4.0	Phone to RIM
49.26	6,090	VE9BJ	St. John, N. B., Canada	0.5	Bc.; relays CFBO	59.70	5,025	ZFA	St. Georges, Bermuda	1.5	Phone
49.26	6,090	CRCX	Colombo, Ceylon	....	Broadcast	60.00	5,000	WWV	Beltsville, Md.	1.0	Frequency standard
49.26	6,090	CRCX	Toronto, Ont., Canada	0.5	Broadcast	60.30	4,975	GBC	Phone to ships	5.0	Phone to ships
49.30	6,085	I2RO1	Rome, Italy	....	Broadcast	60.97	4,920	LKJ1	Rugby, England	1.0	Exp.
49.32	6,083	VQ7LO	Nairobi, Kenya, Africa	1.25	Broadcast	61.54	4,875	RKF	Jeloy, Norway	20.0	Phone
49.34	6,080	VE9EH	Charlottetown, P. E. I.	....	Broadcast	61.66	4,865	CGT	Moscow, U. S. S. R.	....	Phone
49.34	6,080	HJ4ABC	Pereira, Colombia	....	Broadcast	61.66	4,865	VDO	Campbell River, B. C., Can	....	Phone
49.34	6,080	HP5F	Coleo, Panama	....	Broadcast	61.66	4,865	HJA3	Vancouver, B. C., Canada	....	Phone
49.34	6,080	CP5	La Paz, Bolivia	....	Broadcast	61.98	4,840	CZV	Barranquilla, Colombia	....	Phone
49.34	6,080	ZHJ	Penang, Straits Settlements	0.05	Broadcast	62.24	4,820	GDW	Waterloo Mines, B. C., Can	....	Phone
49.34	6,080	W9XAA	Chicago, Ill.	0.5	Bc.; relays WCFL	62.63	4,790	VE9BK	Rugby, England	15.0	Phone to U. S. A.
49.35	6,079	DJM	Zeesen, Germany	....	Exp.	62.70	4,785	CZA	Vancouver, B. C., Canada	0.25	Phone to ships
49.41	6,072	OER2	Vienna, Austria	1.5	Broadcast	63.11	4,753	WOO	Drummondville, Canada	4.0	Phone to ships
49.42	6,070	HP5H	Colon, Panama	0.3	Broadcast	63.11	4,753	WOY	Ocean Gate, N. J.	20.0	Phone
49.43	6,070	HJ1ABF	Barranquilla, Colombia	....	Broadcast	63.69	4,710	YDU2	Lawrenceville, N. J.	20.0	Phone to England
49.43	6,070	VE9CS	Vancouver, B. C., Canada	0.01	Broadcast	65.21	4,600	HC2ET	Medan, Sumatra	....	Broadcast
49.46	6,065	HJ4ABL	Manizales, Colombia	0.2	Broadcast	65.50	4,580	DJG	Guayaquil, Ecuador	....	Broadcast
49.50	6,060	OXY	Skamlebaek, Denmark	0.5	Broadcast	65.93	4,550	WDN	Zeesen, Germany	....	Exp.
49.50	6,060	W3XAU	Philadelphia, Pa.	1.0	Bc.; relays WCAU	66.15	4,535	WDG	Rocky Point, N. Y.	40.0	Phone
49.50	6,060	W8XAL	Cincinnati, Ohio	10.0	Bc.; relays WLW	66.40	4,512	ZFS	Rocky Point, N. Y.	40.0	Phone
49.57	6,050	HJ3ABD	Bogota, Colombia	0.2	Broadcast	66.59	4,505	CGO	Nassau, Bahamas	....	Phone
49.57	6,050	GSA	Daventry, England	....	Broadcast	66.59	4,505	CZO	Ocean Falls, B. C., Canada	0.4	Phone
49.57	6,050	H19B	Santiago de los Caballeros, D. R.	....	Broadcast	66.59	4,505	CZP	Prince George, B. C., Can.	0.05	Phone
49.62	6,045	HJ3ABI	Bogota, Colombia	0.05	Broadcast	66.81	4,490	VDV	Claydon Bay, B. C., Can.	0.1	Phone
49.65	6,042	HJ1ABG	Barranquilla, Colombia	0.15	Broadcast	66.81	4,490	VDC	Two Brothers Lake, B. C., Canada	....	Phone
49.67	6,040	YDA	Tandjongprik, Java	10.0	Broadcast	67.11	4,470	YID	Calgary, Alta., Canada	....	Phone
49.67	6,040	W4XB	Miami Beach, Fla.	2.5	Broadcast	67.19	4,465	CGA4	Bagdad, Iraq	....	Broadcast
49.67	6,040	W1XAL	Boston, Mass.	5.0	Broadcast	67.63	4,436	VDO	Drummondville, Canada	15.0	Phone
49.75	6,030	HP5B	Panama, Panama	0.1	Broadcast	67.72	4,430	VQJM	Vancouver, B. C., Canada	0.4	Phone
49.75	6,030	VE9CA	Calgary, Alberta, Canada	0.1	Bc.; relays CFCN	67.72	4,430	VQJP	S. S. Monarch of Bermuda	....	Phone
49.77	6,028	PRA8	Pernambuco, Brazil	3.0	Broadcast	67.72	4,430	DOA	S. S. Queen of Bermuda	....	Phone
49.83	6,020	XEUW	Vera Cruz, Mexico	0.05	Broadcast	67.72	4,430	GBC	Doberitz, Germany	....	Phone
49.83	6,020	DJC	Zeesen, Germany	8.0	Broadcast	67.72	4,430	GDLJ	Rugby, England	....	Phone to ships
49.85	6,018	ZHI	Singapore, F. M. S.	0.09	Broadcast	67.72	4,430	GBWZ	S. S. Homerie	....	Phone
49.90	6,012	HJ3ABH	Bogota, Colombia	1.2	Broadcast	67.98	4,413	GLRZ	S. S. Berengaria	....	Phone
49.92	6,010	COCO	Havana, Cuba	0.25	Broadcast	68.18	4,400	RRZ	S. S. Aquitania	....	Phone
49.95	6,006	HJ1ABJ	Santa Marta, Colombia	0.025	Broadcast	68.34	4,390	FNSK	S. S. Majestic	....	Phone
49.96	6,005	VE9DN	Montreal, Canada	4.0	Broadcast	68.89	4,355	IAC	S. S. Empress of Britain	....	Phone
49.96	6,005	VE9DR	Montreal, Canada	0.05	Bc.; relays CFCF	69.44	4,320	DAF	S. S. Berlin	....	Phone to WOO, DAF
50.00	6,000	XEBT	Mexico D. F., Mexico	1.0	Bc.; relays XEB	69.85	4,295	WTDV	S. S. Cap Polonio	....	Phone to WOO, DAF
50.00	6,000	YV4BSG	Caracas, Venezuela	....	Broadcast	69.85	4,295	WTDW	S. S. Reliance	....	Phone to WOO, DAF
50.00	6,000	TGWA	Guatemala City, Guat.	0.2	Broadcast	69.85	4,295	WTDX	S. S. Oceana	....	Phone to WOO, DAF
50.00	6,000	YOI	Bucharest, Roumania	0.3	Broadcast	70.00	4,283	IBEJ	S. S. Hansa	....	Phone to WOO, DAF
50.00	6,000	ZEC	Salisbury, S. Rhodesia	....	Broadcast	70.21	4,273	RV15	S. S. Cap Arcona	....	Phone to WOO, DAF
50.00	6,000	RW59	Moscow, U.S.S.R.	20.0	Broadcast	70.22	4,272	WOY	S. S. Deutschland	....	Phone to WOO, DAF
50.04	5,995	RPT	Tashkent, U.S.S.R.	1.0	Phone	70.59	4,250	HJA3	S. S. Hamburg	....	Phone to WOO, DAF
50.04	5,995	WXE	Anchorage, Alaska	0.5	Phone	73.17	4,100	LKJ1	S. S. New York	....	Phone to WOO, DAF
50.04	5,995	WVD	Seattle, Wash.	0.5	Phone to Alaska	73.23	4,097	WND	S. S. Bremen	....	Phone to WOO, DAF
50.12	5,984	TGX	Guatemala City, Guat.	....	Broadcast	74.77	4,002	CT2AJ	S. S. Europa	....	Phone
50.17	5,980	CTIAA	Lisbon, Portugal	....	Broadcast	77.95	3,800	ZP11	S. S. Paris	....	Phone
50.17	5,980	HLX	Trujillo, D. R.	0.2	Broadcast	79.56	3,770	HB9B	S. S. Ile de France	....	Phone
50.17	5,980	HJ2ABD	Bucaramanga, Colombia	0.1	Broadcast	84.67	3,543	CR7AA	S. S. Normandie	....	Phone
50.17	5,980	XEVI	Mexico City, Mexico	....	Broadcast	85.11	3,525	HB9AQ	Moscow, U. S. S. R.	1.0	Phone
50.21	5,975	XECW	Xantocam, Mexico	0.01	Broadcast	88.83	3,376	HJA3	S. S. Normandie	....	Phone to Paris
50.21	5,975	HJ2ABC	Cucuta, Colombia	0.25	Broadcast	88.83	3,376	HJA3	Coltano, Italy	56.0	Phone to ships
50.25	5,970	XEIO	Mexico D. F., Mexico	....	Broadcast	88.83	3,376	HJA3	Norddeich, Germany	....	Phone to ships
50.26	5,969	HVJ	Vatican City, Italy	10.0	Broadcast	88.83	3,376	HJA3	St. Thomas, Virgin Isl.	0.25	Exp.
50.28	5,966	HJ1ABC	Quibdo, Colombia	0.1	Broadcast	88.83	3,376	HJA3	St. Croix, Virgin Isl.	0.25	Exp.
50.42	5,950	HJN	Bogota, Colombia	....	Broadcast	88.83	3,376	HJA3	St. John, Virgin Isl.	0.25	Exp.
50.45	5,946	FIU	Tananarive, Madagascar	0.5	Broadcast	88.83	3,376	HJA3	S. S. Conte Rosso	....	Phone to IAC, WOO
50.50	5,940	TG2X	Guatemala City, Guat.	0.2	Police; bc.	88.83	3,376	HJA3	S. S. Rex	....	Phone to IAC, WOO
50.59	5,930	HJ4ABE	Medellin, Colombia	0.1	Broadcast	88.83	3,376	HJA3	S. S. Conte di Savoia	....	Phone to IAC, WOO
50.76	5,910	HH2S	Port-au-Prince, Haiti	0.1	Bc.; relays HH2T	88.83	3,376	HJA3	S. S. Conte Verde	....	Phone to IAC, WOO
50.93	5,890	JIC	Tyureki, Formosa	6.0	Phone to Japan	88.83	3,376	HJA3	Khabarovsk, U. S. S. R.	20.0	Broadcast
50.98	5,885	HCK	Quito, Ecuador	....	Broadcast	88.83	3,376	HJA3	Ocean Gate, N. J.	20.0	Phone
51.02	5,880	ETG	Addis Ababa, Ethiopia	3.5	Phone	88.83	3,376	HJA3	Barranquilla, Colombia	....	Phone
51.02	5,880										

A New 50-Watt
A M A T E U R
T R A N S M I T T E R

A "step-by-step" kit with which the amateur may start constructing with a 50-watt unit for c.w., later adding a modulator and a carrier control unit

By Everett M. Walker (W2MW)



A NEW kit transmitter, designed by the engineers of the United Transformer Corporation, offers the amateur something modern and flexible in equipment. It provides at small cost a rack-and-panel unit that is "commercial" in appearance. Actually it is, for all of the mechanical work is done including drilling and the mounting of parts. All that has to be done is to follow the schematic wiring diagrams.

The "Unit" System

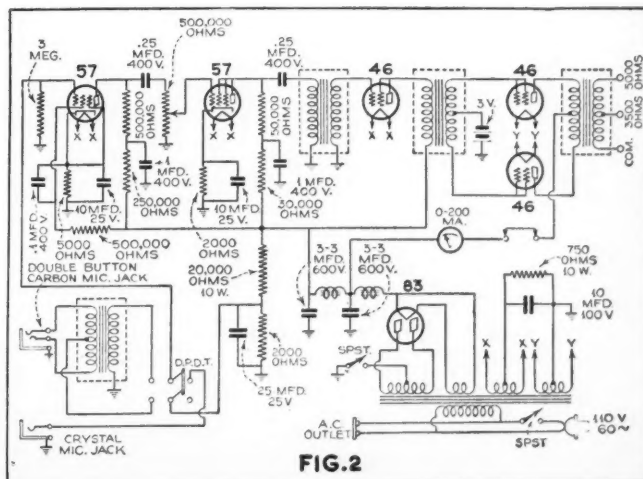
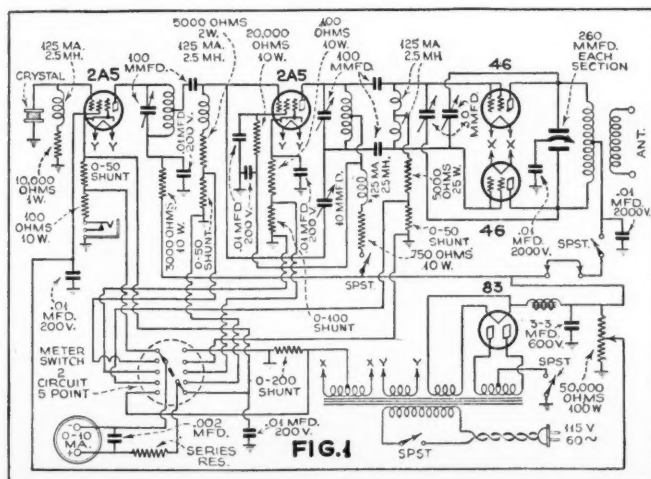
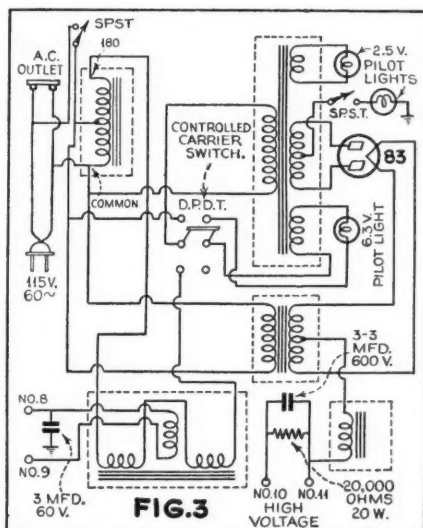
An interesting feature of the kit is that it is designed so it may be constructed in stages starting with a 50-watt radio frequency unit for c.w. (See Figure 1), then a modulator (See Figure 2) may be added and finally a controlled-carrier unit (See Figure 3). These three units may be mounted one above the other in a steel cabinet when all are assembled. Further, the 50-watt 'phone transmitter virtually becomes a higher-powered unit when the controlled-carrier equipment is added, as this arrangement facilitates operating the Class C tubes in the r.f. unit at higher inputs inasmuch as the input varies in this circuit with speech and the normal rating of the tubes is only momentarily exceeded. With the controlled-carrier system the peak output will be more than 75 watts. This unit employs economical tubes so that the upkeep cost is kept low.

Later on, if the builder desires more power a companion unit may be constructed that will greatly increase the output and put the transmitter in the high-power class. This unit consists of a controlled-carrier Class B linear stage. In addition it includes a power supply unit that will deliver 3,000 volts to the push-pull 852 type tubes used in the Class B linear stage. Also, an antenna tuning unit and cathode-ray oscilloscope in a companion cabinet are available.

All that is necessary to construct the transmitter units is a soldering iron, some solder, pliers and a screwdriver. The logical unit to start with is the 50-watt c.w. transmitter. Essentially this consists of a 2A5 tube used as a crystal oscillator, a 2A5, which may be used as either straight buffer, doubler or tripler and a pair of type 46 tubes in push-pull in the final stage. The unit is complete, including the power supply for all three stages. One of the interesting features is the novel switching arrangement for controlling the single meter used to measure plate and grid currents in each stage. A O-10 milliammeter is employed with multipliers connected in the switching arrangement so the meter will give the most convenient reading regardless of circuit. For instance the multiplier for the class C stage is twenty, thus making the meter a O-200 milliammeter. For the first buffer grid current the multiplier is 2, thereby providing a O-20 m.a. range. The meter reads current in five circuits.

Front Panel Control

Three tuning controls are provided on the front panel together with switches for cutting out each stage to facilitate tuning. Another feature is the use of a voltage divider to obtain screen current for the crystal oscillator tube. A similar arrangement (*Turn to page 766*)





More Data on the FINAL Amplifier

LAST month we described a medium powered amplifier using an Eimac 150T tube. Since this unit was completed we have had time to do considerable experimental work with it. These tests have shown that such an amplifier offers interesting possibilities on 5 and 10 meters when using the transmitter described in the previous issue as an exciter.

SOME information on the tests and general operating data on the 150T final amplifier unit show that it is extremely flexible. It provides the "ham" with an efficient all-band transmitter. Above all, it makes available a crystal-controlled 5-meter transmitter that really works! Anyone who has attempted to get such a transmitter to function can attest to the problems encountered. First, it is difficult to get sufficient driving power to permit modulation on a 5-meter power amplifier. Second, the adjustment is very critical and, third, the placement of the parts to obtain the greatest possible excitation and output is extremely important.

Reviewing some of the features of the amplifier described last month, it will be noted that there are three meters on the front panel: one for grid current, filament voltage and plate current. While it is convenient to have separate meters for grid and plate current, one meter might have been used and jacks provided in each of these circuits. The voltmeter is essential when tubes that have thoriated-tungsten filaments are used, and it should be connected directly across the filament terminals at the base of the tube. The filament in the 150T is rated at 5 volts at 10 amperes. With this high current there is apt to be considerable voltage drop in the leads to the transformer and, therefore, readings at any other point would be in error.

Another point, with tubes of the thoriated-tungsten filament type, the voltage should never go below the manufacturer's rating. Also, it should be maintained at full rating when plate power is applied. Slightly higher voltages are permissible, but never lower. With this particular tube the voltage may be increased to 5.3 volts without

damaging the tube. This allows leeway if the filament voltage drops due to the increased line load when the plate current is applied.

Terminal connections are brought to stand-off insulators mounted on the back of the baseboard. The positive high voltage is connected to the switch shown at the right. The use of the switch simplifies adjustment when changing bands and neutralizing.

In both the grid and plate circuits split stator condensers are used. The reasons for using these condensers are twofold. One: they eliminate the necessity for bypass condensers which is a desirable feature when high plate voltages are used. Two: they provide permanent neutralization which, of course, is desirable in a transmitter where band changing is utilized.

One of the most important things in obtaining high efficiency in an amplifier of this kind is the use of a plate-tank circuit that offers a proper load for the tube used. The constants, of course, will vary with plate voltage, current and frequency. However, in general it might be said that minimum tank-circuit capacities, for frequencies lower than 4 megacycles, should be 50 mmfds. when split stator condensers are used and 15 mmfds. on both 40 and 20 meters. When modulation is used, slightly higher minimum capacities might be necessary.

Also, tubes of the type employed are designed for high-voltage operation. In adjusting such an amplifier care should be taken in noting that the plate does not have to dissipate more than the recommended plate dissipation. While in tubes

A SIGN FOR YOUR SHACK

This unique "ham" sign, the overall dimensions of which are 16 inches long by 3 1/4 inches wide and 3 1/8 inches high was carved by a reader who, due to the development of partial paralysis, has resorted to this means of earning a livelihood. The carving is finished in transparent lacquer, preserving the pleasing appearance of the natural wood. These signs, made up to order with any amateur call, cost one dollar each and the name and address of the maker will be supplied on request. A similar carving of your name or monogram may be obtained for the same price



The "HAM" Shack

Conducted by
Everett M. Walker
Editor for Amateur Activities

A REAL YL
Miss Nell Corry
of Surrey, England,
tunes her 10-meter
transmitter. Her
call is G2YL!

of this type tantalum is used for the plate which has less tendency to cause gas to form within the envelope on momentary overloads than other metals, it is desirable to keep the plate well within recommended limits. Proper plate dissipation may be determined by noting the color of the anode. A dull red color will denote 150 watts dissipation—the limit. The plate shows a perceptible red color at 100-watts dissipation. However, the manufacturer says these rated values may be exceeded momentarily by more than 400 percent, without impairing the vacuum.

Adjustment of such an amplifier is the same as with other stages in the transmitter described two months ago. Briefly, in review, the first step is neutralization. The excitation stages should be first adjusted for maximum output. The amplifier is link-coupled to the exciter unit. With the plate switch open, the grid circuit should be tuned to resonance, which is indicated by maximum grid current. It should be kept as near as possible to 50 milliamperes. Then attach a neon bulb to one end of the plate-tank circuit and tune the tank condenser until the bulb glows. Unless the amplifier is accidentally neutralized, a decided resonance point will be found. The neutralizing condenser then should be adjusted until there is no radio-frequency energy whatsoever in the plate-tank circuit. The neutralizing condenser may be adjusted with a long stick while excitation is applied. Then retune the plate-tank condenser to make sure the neon bulb does not glow at any other point. If it doesn't, the amplifier is neutralized.

Applying B Voltage

The next step is to apply the plate voltage. It is a wise precaution to reduce it to about 1000 volts and connect a 500-ohm resistor in series with the plate lead. The resistor should, of course, be a husky one, preferably about 200 watts. The plate-tank circuit is then tuned for minimum plate current. Finally the antenna is coupled to the plate tank and tuned to resonance, then the plate voltage (with resistor removed) is stepped up to normal.

In actual practice the amplifier was made to deliver as much as 450 watts into the antenna on 14 megacycles. With 2000 volts at 200 milliamperes applied to the plate (400 watts input) more than 300 watts output was obtained. This is better than 75 percent efficiency, which is unusually good for a Class C amplifier. The high output was obtained with 3000 volts at 200 milliamperes. The tube ran cool at this input, but such high inputs are not recommended for 'phone (continuous) operation. The tube will take 500 watts input with plate modulation, however, without being overloaded.

The amplifier is capable of handling 400 watts input at 28 megacycles efficiently. For 5-meter operation, the plate voltage was dropped to 1000 volts and better than 100 watts output was obtained with the plate current at 200 milliamperes. Although higher inputs were not tried at this frequency, the tube appeared capable of handling more power and ran cool, considering it was being used as a double-final

A Department for the amateur operator to help him keep up-to-date

which, of course, is not as efficient as a straight amplifier. However, it would be difficult to drive the grid of the tube at 5 meters with the exciter unit available, so this arrangement was not tried. Suffice to say that a good 5-meter crystal-controlled signal is possible with this arrangement!

20-Meter Crystal

Since the article was written last month, tests have been made with a 20-meter crystal in the oscillator circuit. This resulted in increased outputs on both 5 and 10 meters. By using the 53 type tube in the conventional oscillator-doubler arrangement originally described, even greater driving power was possible on the two ultra-high frequency bands. One triode portion of the 53, of course, was tuned to resonate with the crystal; the other is tuned to 10 meters, and all other circuits beyond this to the same frequency. 5-turn coils 1 inch in diameter served for all circuits, i.e., buffer plate, second buffer grid and plate and grid of the 150T amplifier. No. 10 copper wire was used for each.

When tuned up it was possible to drive the 150T at 50 milliamperes grid current at 28,000 kilocycles. Also with this high driving power the final amplifier performed much more smoothly than it did when a 40-meter crystal was used and the grid current was 30 milliamperes.

It was indeed surprising to discover what could be done with this arrangement on 5 meters. It was not possible to drive the 150T grid at 5 meters efficiently. This was due to the use of the 211 in the second buffer stage. This type tube, of course, is not a high-frequency tube. It had a tendency to do all sorts of tricks. Had a 50T or similar type tube been substituted in the second buffer stage it would have been possible to get some driving power on 5-meters. But, we did find that excellent outputs on 56 megacycles could be obtained by using the 150T with somewhat reduced input as a 5-meter doubler.

Furthermore, the unit performed much more efficiently than it did with a 40-meter crystal. As we pointed out last month we were able to get a good signal out with this arrangement, but it appeared to be requiring an exceedingly high input for the output we were obtaining. However, the higher grid excitation when the 20-meter crystal was used, resulted in a big increase in output. Also, the modulation problem was

(Turn to page 749)

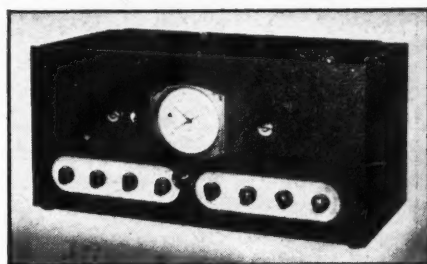
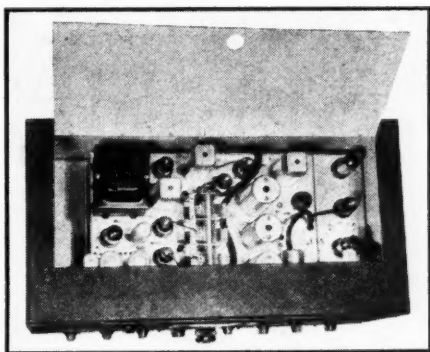
New RECEIVER has Complete Coverage

By Donald Ames

A NEW receiver, the ACR-175, incorporating a number of new features, has been announced by the RCA Manufacturing Company, Inc., of Camden, N. J. The receiver is truly an all-wave set. Its range is from 500 to 60,000 kilocycles, which takes in all services (from ships through broadcasting and all amateur bands, including 5 meters). Other features of design include metal tubes and

DETAILS OF CONSTRUCTION

The photograph and diagram, below, show the arrangement of the parts and the circuit for the new all-band receiver



SHIPSHAPE HAM SET

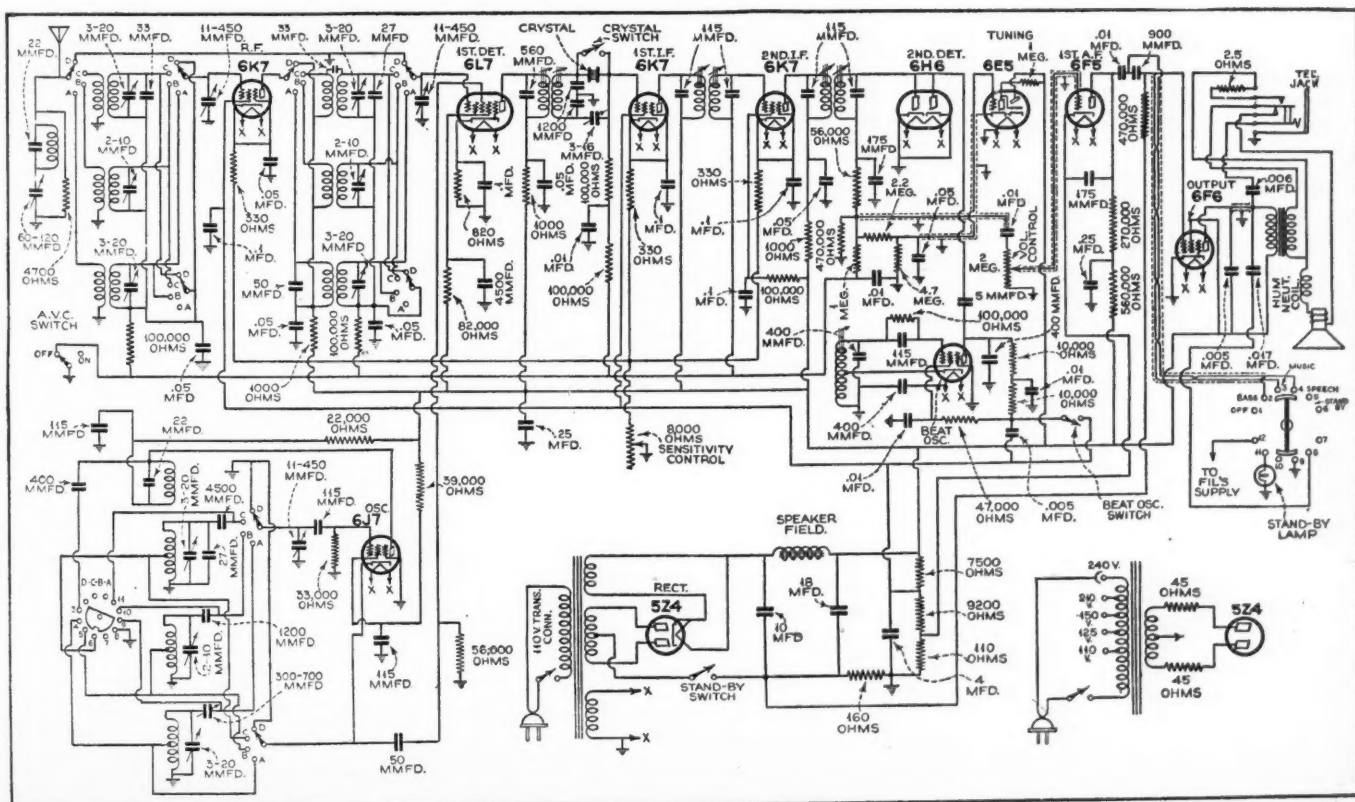
Front view of the ACR 175 receiver, which covers all frequencies from the 5 meter to the broadcast band, inclusive

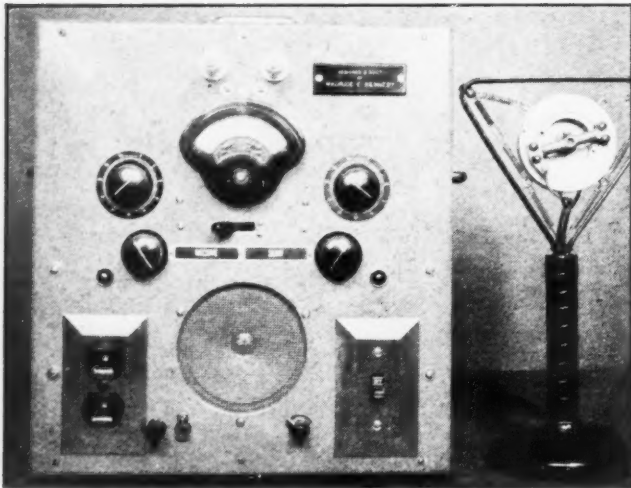
a calibrated signal-input indicator which makes use of an electron-ray-tube tuning indicator.

The wide frequency coverage is obtained by means of four bands ranging from: one, 500 to 1690 kilocycles; two, 1690 to 6200 kilocycles; three, 6200 to 15,450 kilocycles, and, four, 15,450 to 60,000 kilocycles. A stage of radio-frequency amplification, employing a 6K7 type tube, is used on all but the ultra-high-frequency range. On this band, the r.f. stage is cut out, the antenna being switched, for direct coupling, to the first detector tube. The inductances of this circuit consists of a short length of bus bar.

Another feature that will interest the amateur is the calibrated signal-input indicator. This makes use of the electron-ray tuning "eye" which is connected in the second detector circuit. Its action is dependent upon the signal strength at this point, when used in conjunction with a calibrated signal-input control. The method of operation is simple. It consists of tuning a signal to exact resonance, then, by reducing the calibrated control until the deflection on the cathode-ray tube is $\frac{1}{4}$ th of an inch wide, noting the microvolt reading on the calibrated control. This method is effective for 'phone carrier measurement where the signal is constant. For telegraph signals accurate measurements may be made by adjusting the calibrated

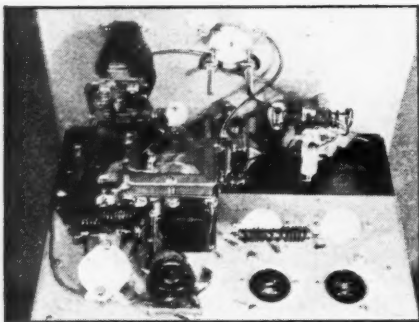
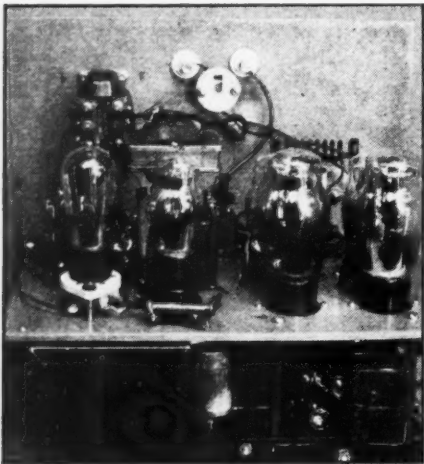
(Turn to page 759)





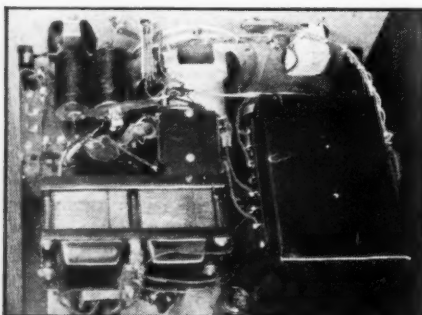
THE FINISHED UNIT

Ready portability and neat appearance are outstanding features of this compact combination. An inside view is shown below



THE INTERIOR LAYOUT

The arrangement of parts above the shelf is shown immediately above, while the view below shows the lower rear half of the front panel and the under side of the shelf



How to Build a 5-METER X'MITTER RECEIVER

By Maurice E. Kennedy

W6KQ, W6BGC

FOR the amateur with limited means, the 5-meter band offers an excellent opportunity to build inexpensive equipment that will give the constructor many hours of operating satisfaction.

At the present state of the art, distances on the ultra-high frequencies are limited, due to the apparent lack of refraction or bending of the transmitted sky wave. With rare exceptions 5-meter communications are limited to the extent of the station's ground wave which attenuates rapidly a few miles past the horizon, and in view of this phenomena it would appear that high power on the 5-meter band is of limited value and that an efficient low-powered transmitter with a suitable antenna should normally be as effective as the high-cost, high-powered transmitter with most of its energy headed for Mars or interstellar space.

Employs Receiving Tubes

Practically all of the so-called receiving set power tubes have been used or tried on the higher frequencies in the past, and in designing this transmitter the type 45 was selected as the most suitable for push-pull operation.

For stability, a straight oscillator should not be modulated over 50 or 60 percent, and two type 2A3's are more than adequate as modulators and final amplifiers.

A type 56 tube is used as a super-regenerative detector in the receiver,

and a 56 is also used in the first audio stage.

After pricing suitable metal boxes to house the equipment, we decided to attempt building a substitute which turned out even better than we anticipated. A description follows for those who desire to build a similar housing.

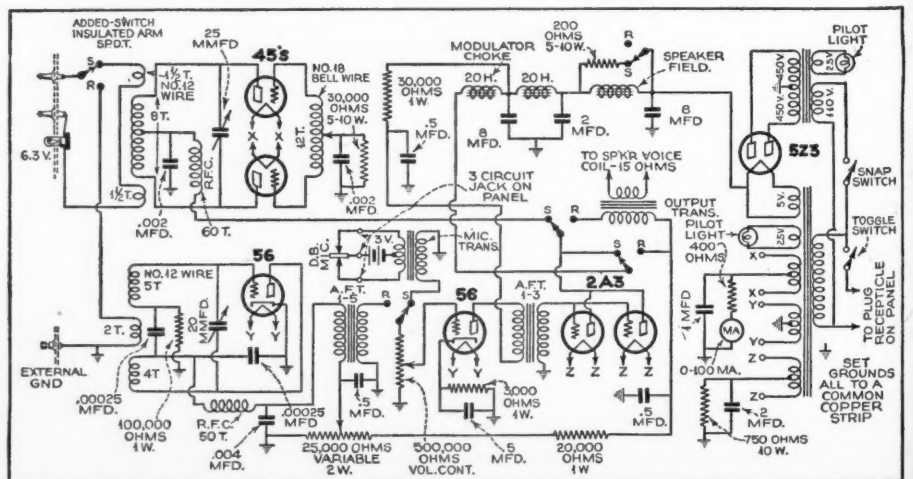
A small, sturdy, wooden box was obtained from a local grocery store and covered with 28-gauge sheet metal at the cost of but a few cents. The edges of the sheet metal were soldered together and all rough spots filed smooth. Four 3-inch ventilator holes were cut in the back with an expansion bit to permit circulation of air to the tubes, and a square piece of galvanized window screen large enough to cover all four openings was tacked to the inside of the back of the box. This helps prevent dust from reaching the inside of the set and adds to the finished appearance of the case.

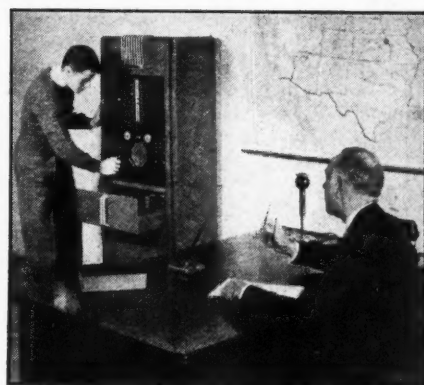
Two coats of aluminum paint inside and out give the metal-clad box the appearance of a metal shop product.

For convenience in carrying, brass handles from the dime store were bolted to the top and sides. Four rubber feet also from the dime store were screwed into the bottom to prevent the sharp edges from scratching the table top.

The panel should be cut to fit the open or front side of the box, and in this case, measures 14 inches wide by 14 3/4 inches high. The panel was ob-

(Turn to page 766)





INSTALLED IN A SCHOOL



IN A HOTEL



IN A DEPARTMENT STORE

THE SELF-CONTAINED P. A. SYSTEM INSTALLED IN A HOSPITAL
Musical programs from the air, phonograph records, and announcements can be distributed throughout a building to other similar units that can be operated by anyone after only simple instructions.

Servicemen!

Architects!

Here is a New Idea in SOUND SYSTEMS

(For Schools, Hospitals, Hotels, etc.)

By E. Jay Quinby

A BRAND-NEW idea in electrical sound-reproducing systems is embodied in a new self-contained unit that can be used in hospitals, schools, hotels and department stores in distributing programs from microphones, from phonograph records or direct from a receiver incorporated in the unit. The new cabinet sound-system was developed by the Bell Telephone Laboratories and is being introduced by the Western Electric Company. Servicemen and sound experts should be able to get a number of good ideas from a description of it. The device certainly opens a new field of usefulness where a compact and complete sound system is to be installed without in any way interfering with a building's structure.

A Two-Way System

A special feature of the system is that it provides "talk-back" facilities. Sound not only may be sent out for reproduction over distant loudspeakers, but the same loudspeakers may in turn be used as microphones for picking up sound which is transmitted back to the central point. In many types of service, the "talk-back" feature has special importance, in that it offers a means for overhearing in the central office what is happening at any loudspeaker location. For example, the principal of a school may listen to the work in any classroom, or the proprietor of a department store may overhear transactions be-

tween personnel and patrons in any department he desires.

In hotels, the system not only supplies entertainment to guest rooms in the form of radio programs and recorded selections, but it may also be employed to amplify and distribute music from the hotel's own orchestra. Moreover, it may be used for paging throughout public rooms and corridors.

In hospitals, it likewise serves for paging doctors throughout the institution. The talk-back circuit makes it possible for a doctor to talk with the main office over the nearest loudspeaker extension. Radio programs and recorded selections furnish diversion in rooms where convalescent patients are located.

As an aid in teaching music and the languages, the sound system brings special recordings right to the classroom, as well as providing distribution of radio programs throughout the building. Announcements may be made and fire drills directed from the principal's office. Music may be furnished for gatherings in the auditorium, and the amplifying facilities may be employed to reinforce speakers' voices.

1 or 2 Channel Systems

Two variations of the program sound system are available, the first arrangement providing for a single program, and the second for the choice of two simultaneous programs. In the first case, one amplifier and in the second, two are used. Switching facilities in-

clude as many as 60 keys for controlling the loudspeaker or headphone extensions. These keys are mounted in groups of 20, and may be wired so as to control each extension individually or several extensions in groups, as required.

The radio receiver is of the high-fidelity type, covering a band of frequencies ranging from 520 to 23,000 kilocycles. This wide band includes not only domestic broadcast stations but also police, aircraft and amateur stations as well as foreign short-wave broadcasting stations. Automatic volume control eliminates to a great extent the fading of foreign short-wave stations. The two-speed electric phonograph is mounted in a retractable drawer. This may be pulled out for convenient operation or closed up flush with the front of the cabinet as desired. (Turn to page 749)



ALL DOORS OPEN TO THE W. U. MESSENGER

ONLY individual enterprising aggressiveness and effort can win under present conditions in the radio servicing industry. Your competitors may pay the same wages, have approximately the same overhead expenses, observe the same working hours, and do just as good service work as your shop does—at comparable prices. This means that as far as your prospective customers are concerned, they can have their service work done just as satisfactorily by your competitor's

shops as they can by yours. What can you do to steer their business over to yourself? Under such conditions, the largest volume of business will likely go to the service shop which is *best known in the community!* In today's competitive fight for profitable business, there is one extra added advantage you can secure, if you will but get busy to create it. You must **MAKE YOUR TRADE PREFER TO DO BUSINESS WITH YOU!** You can establish a reputation for good work, fair prices and square dealing; and maintain a close feeling of friendly relationship between the prospects in your community and YOU, by sufficiently frequent mailings of well-prepared friendly, human, snappy little messages to a selected list of prospects (and also to your own steady customers). "Direct-mail" advertising is that which is *delivered* directly to the customer or prospective customer by mail. Though much advertising is sent through the mails, most of it is seen by the recipients and, if interesting enough, is read. Direct-mail is comparatively easy to check up on for returns.

Material prepared for direct-mail can sometimes be effectively distributed by hand. Western Union messengers have been successfully used for this purpose. Using other methods, the personal touch of a letter or post-card is lost and it is not given the attention that direct mail receives.

SAMPLES OF MAILING PIECES
The accompanying cards have all brought real results

→ "X-RAY" YOUR RADIO! ←

- AT LAST! - Scientific "X-RAY" of your radio now possible with the new Cathode Ray Oscilloscope.
- ELIMINATES Guess work.
- DEFECTS made Visible.
- PERFECT ADJUSTMENTS possible only with the CATHODE RAY "Magic Eye".

Expert Service Engineers - Our Work Guaranteed.

SIX POINT CHECK on your RADIO (in your HOME)

1. Test All Tubes.
2. Test All Voltages.
3. Check Speaker.
4. Inspect Aerial and Ground.
5. Check Power Unit.
6. Check Alignment.

75c SPECIAL

This set made in U.S.A. for direct personal installation and early return.

WORLD RADIO - 21 LEXINGTON - LIBERTY 7751

I went to school-

JOHN JONES
Radio Service Technician
100 Main St.
NEW YORK
Main - 2000
ESTABLISHED 1928

I wasn't satisfied with being a good radio "tinker". I wanted to become an expert technician. So I went to school - learned all about oscillators, not amplifiers, audio amplifiers, intermediate frequencies, vacuum tubes, electrical interference, cathode-ray - well, in short, I studied all the latest scientific methods for doing a better job of servicing more economically.

Perhaps that's why so many of my customers today recommend me to their friends. Perhaps they have to you - but in any case won't you come in or call up - and let me look over your set without obligation? I may be able to save you some money.

HAVE YOU OLD RECORDS . . .
AN OLD PHONOGRAPH?

When you can't get what you want on the radio, why not listen to your old favorites on your phonograph—played through your radio?

It costs very little to install an electric motor and pickup in your old phonograph and connect it to your radio . . . Then you can have the music you want when you want it, without even bothering to wind a spring. Phone us; we'll be glad to tell you more about it.

YOUR IMPRINT HERE
Street Address Phone Number
City and State or Station here

Welcome Neighbors!

Please accept our offer of a little friendly service. Let us send over one of our technical men to install your radio. Radios are fussy you know - they aren't happy unless they're "set just right".

If also you want an antenna erected or repairs made, we'll be glad to give you a Special Introductory Rate - but there's **NO CHARGE** at all for the installation.

Just phone Main 1000 and we'll be right over.

BLANK RADIO SERVICE, INC. 100 Main St. Tel: Main 1000

Write Care in Box

1. Was the service work on your radio satisfactory? Yes ☐ No ☐

2. Were the employees you came in contact with courteous? Yes ☐ No ☐

3. Are you so satisfied with our service that you would recommend us to a friend or relative? Yes ☐ No ☐

Remarks: _____

Your Name: _____

Address: _____

"SELLING"

Many independent servicemen, after advertising "splurges" with the usual conclusion that this is just a means for large successful organizations use this. They have learned that well-planned service a lot easier and quicker, but in How do they get these results?

By A. A. Ghirardi
Part

No "Success" Formula for D-M Advertising

No simple "success" formula can be glibly handed out for direct-mail advertising. Remember that always! There are no "circuit diagrams" that will enable one to construct a sure-fire promotional campaign. Advertising is a technique of trial and error—but, many of the errors can be avoided by following a few general principles and benefiting by the tested experience of others!

Fields for Direct-Mail

There are five fields in which properly-prepared direct-mail campaigns can be of definite business-getting value to the radio serviceman. They are:

1. For securing new customers.
2. Good-will contacting of present customers immediately after servicing their receivers.
3. Good-will "reminder" contacting of past customers.
4. Sale of special services such as noise-reducing systems, phonograph attachments, etc.
5. Securing household appliance service work.

The wide-awake serviceman plugs all five of these angles, for each one can be turned into a revenue producer.

What to Send

Cost must naturally be kept down as much as possible in order to make your advertising pay. The total cost depends on many factors—the "format" (that is, the postcard, folder, letter, blotter, station log, etc.), postage cost, cost of list, addressing cost, etc.

Though not usually as impressive as some of the other formats, the postcard

SERVICE"

making a few misguided direct-mail disappointing results, come to the con-throwing away good money. Yet most scheme and get real results from it. campaigns not only make selling sets and many cases do the whole selling job! What are their secrets?

and T. S. Ruggles

Four

often "pulls" better for radio servicemen. It is also the best "buy" in postage, for it goes first-class for one cent in the U. S. A. If you have a fairly long story to tell, your best format will probably be a "form letter". A multi-graphed or "offset processed" letter is more expensive than a mimeographed letter, but is far superior in appearance. You can probably get just as good results if you start your letters with, "Dear Friend," as if you go to the expense of a personal fill-in for each one. You will find organizations listed in your telephone directory, who will quote you rates on multigraphing and addressing.

Folders are used extensively, but are generally too expensive for the average serviceman to prepare himself. Many good ones can be obtained at a cost of about \$1.00 per 100 from leading radio and tube manufacturers. Blotters do not get the attention of the prospect

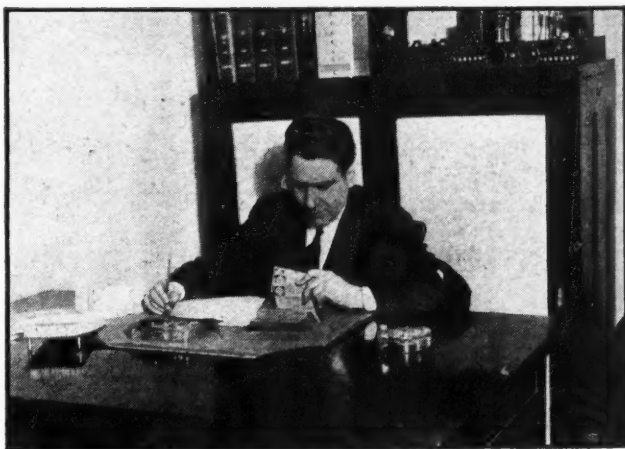
that they did years ago. Good station logs are effective. Novelties too often fail to sell what they are intended to sell—the prospect's attention is diverted by interest and curiosity to the novelty itself, rather than to the sender.

Preparing the Literature

First of all, *plan* your advertising. Study the different formats you feel will serve your pocketbook and your purpose best. Then work out a consistent, logical plan, coordinating your direct-mail advertising with whatever other adver-

tising or merchandising you do. Don't jump from one thing to another in hit-or-miss fashion. You will accomplish nothing that way.

Your direct-mail pieces must have "attention-value" if you expect them to register on the minds of people. Without being offensive, or too "high-pressure," they must make a striking impression in a flash. That impression may come from an attention-getting heading, the message (idea content), or the physical appearance of the advertising; preferably (Turn to page 765)



RESULTS COME ROLLING IN

A well-planned direct-mail advertising campaign or sales promotion plan does bring results, and when the morning's mail brings you many "returns" and actual orders you too will find that the effort spent is well worth the care necessary in the preparatory work you must do

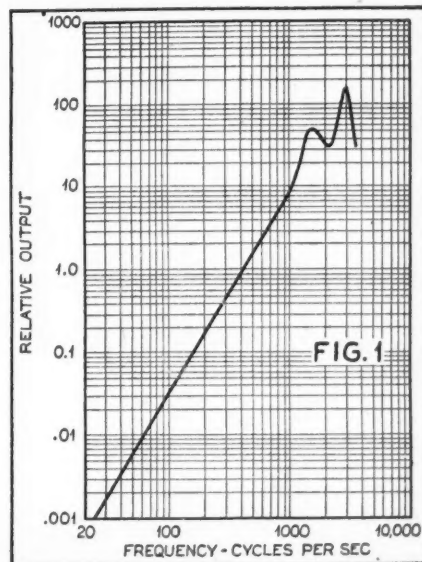
New VIBRATION PICK-UP


By John H. Potts

WHEN Rochelle salt crystals are placed under mechanical strain, an electric charge appears on their surfaces. This charge is proportional to the amount of bending, and if the bending is vibratory in character the electric charge will likewise vary at the identical rate. This phenomenon is utilized in the new Vibration Pickup just announced by the RCA Manufacturing Company.

With this small instrument the location of sources of mechanical noise in machinery, the causes of vibration in motors, buildings, foundations, and even the relative smoothness of several surfaces may be determined. The direction in which the vibration travels is likewise obtainable.

The construction is quite simple. A square crystal is supported at three corners by viscoloid mountings, leaving the fourth corner free to vibrate. With this mechanical design the danger of breakage of the crystal under very severe vibration is remote (Turn to page 759)





ELEPHANTS NEVER FORGET

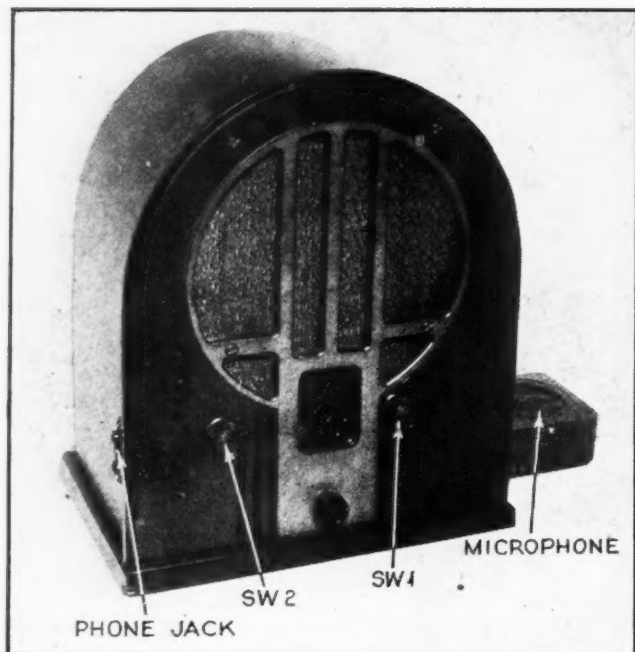
If you had an elephant around the house, he'd remind you to phone

Since you haven't an elephant of your own, we are sending you this one. May he remind you to have us test your radio tubes and make necessary replacements with Sylvania Set-Tested tubes.

Construction Details of a Home Built

Those who are hard-of-hearing radio receiver, revamped to serve the conversation of family and

By Samuel



THE REVAMPED RECEIVER

As shown here, this standard receiver serves as a radio, a hearing aid and a telephone amplifier. Radio programs may be heard through either the loudspeaker or ear-phone, as desired

RECENT developments in microphones and vacuum tubes enable the construction of a finer hearing aid in a more compact form than has been possible heretofore. The Piezo-Astatic (rochelle salt) crystal microphone offers fidelity of sound reproduction exceeding that of the finest carbon microphone and has the advantage of being perfectly quiet in operation. This microphone has a much higher output level than any with comparable fidelity and quietness of operation, and in conjunction with the recent development of high-gain audio amplifier tubes, makes practical the construction of a hearing aid of very superior features, without high cost.

Since the most useful form of such

an aid is that which combines a telephone amplifier and also a radio for entertainment, such a combination unit will be described here. In choosing a radio receiver for this work, the author selected one that would supply 6.3 volts for the filament of a 79 tube, which is added to serve as a two-stage microphone amplifier. The receiver chosen was a Philco 84-B mantel type, a.c. operated and employing an 80 rectifier and type 42 output tube. The choice of an output tube with high gain is important, and the 42 is one of the best. The 79 tube offers the highest gain possible from one tube without complicated hook-ups.

The crystal microphone has the advantage of requiring no input transformer. This is important, as hum is

hard to eliminate and a transformer would add to the difficulty.

In the earlier combination radio and hearing aid, described on page 81 of the August, 1934, issue, we used a radio set from which the loudspeaker had been removed, but this time we will retain the loudspeaker, the microphone being mounted outside the cabinet in a position enabling a telephone receiver to be placed on it when used to amplify telephone conversation.

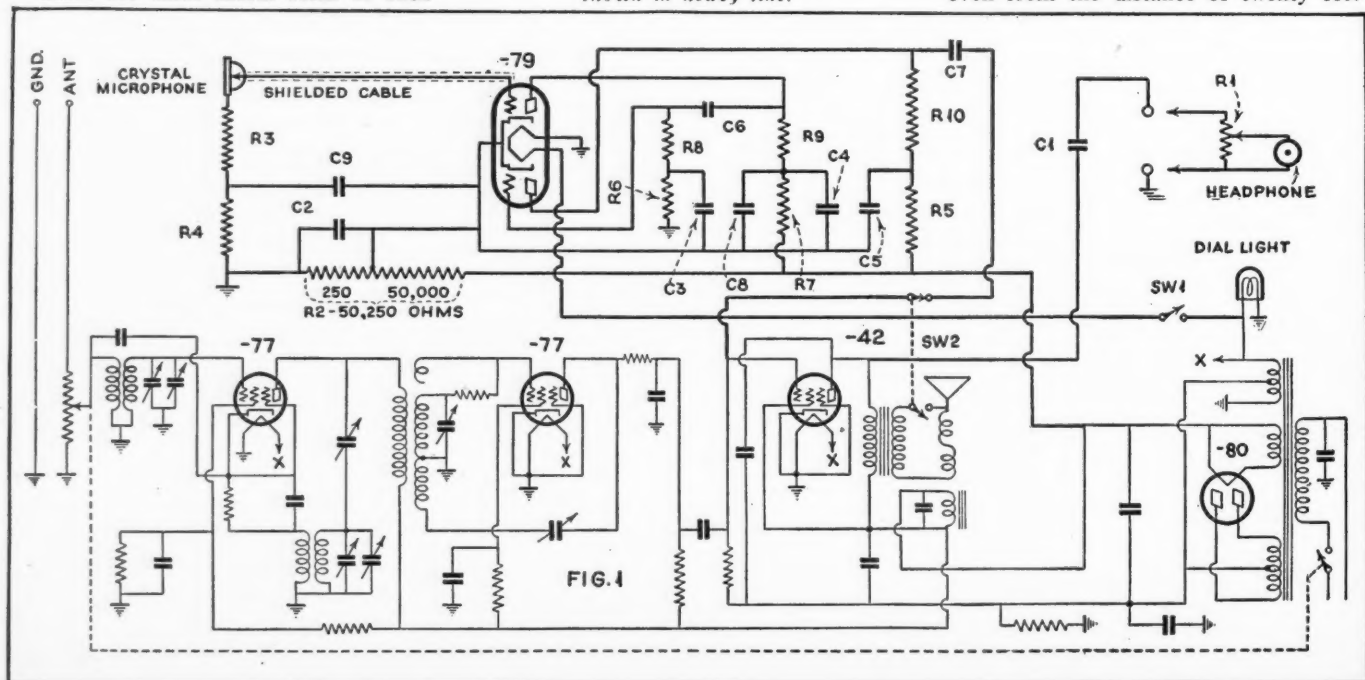
Using the Loudspeaker

If we are to use the loudspeaker, means must be provided to connect the hearing aid and loudspeaker alternately; if both are on at the same time a squeal will result, due to acoustic feedback. This alternate connection is accomplished with a two-circuit switch (SW2), in a manner that eliminates the possibility of connecting both at once.

Use of the 79 as a two-stage resistance-coupled voltage amplifier, with the simple hook-up shown, provides a tremendous gain, and the output of the crystal microphone, after being amplified through this tube and also the 42 output tube, gives all the volume it is possible to use; the limiting factor being the acoustic feedback from the earpiece, even from the distance of twenty feet

THE SCHEMATIC DIAGRAM

Figure 1. This is the circuit of the Philco Model 84-B receiver with the additions, as made by the author, shown in heavy line.



Combination Receiver and Hearing Aid

will find joy in this standard also as a hearing aid to reproduce friends with volume and clarity

B. Simer

which is the length of the earphone connecting cord supplied. Incidentally, a good test for sensitivity and gain in the finished job is to see that the feedback does occur from the earphone at twenty feet.

Changes to Be Made

The one great difficulty in a high-gain amplifier to be operated from a.c. lines is a.c. hum, which is hard to reduce to a point practical for headphone operation with only the amount of filtering provided on these small sets. However, if the hum in the set is no more than the average to begin with and care is taken to avoid shorts that place unnecessary load on the filter, the hum in the finished job will be negligible when the earpiece volume is controlled with a potentiometer type volume control, equivalent to the one described in the parts list.

Removing the radio from its cabinet, unsolder one lead of the speaker voice coil from the output transformer secondary. Later a switch will be connected here. Also connect the .5-mfd. condenser, C1, from the 42 plate circuit to one side of the twin phone jack; the other side of the jack can go to the chassis.

We find a space at the right-hand end of the chassis, behind the power transformer, measuring approximately 2 inches by 4 inches, with nothing beneath the chassis excepting a dual by-pass con-

denser which can easily be shifted to a position under the power transformer and thus out of the way.

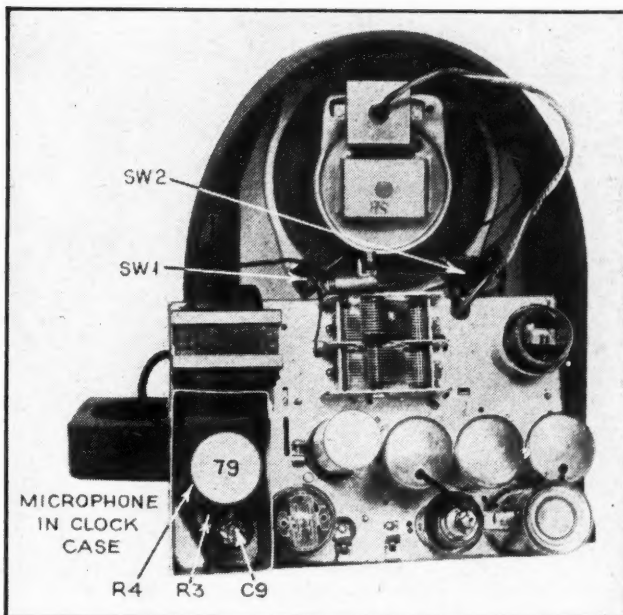
Cut a hole in the chassis behind the power transformer with its center 1 inch from the end and $2\frac{1}{4}$ inches from the rear, and install a six-prong wafer socket and tube shield from the 79 tube. Obtain the filament power by running a line from the top of the dial light through a s.p.s.t. rotary switch, S1, to one filament connection, and the other side of the filament can be grounded to the set chassis which forms the return side of the filament circuit. This s.p.s.t. switch will be located on the right-hand side of the tuning dial in the space between the tuning condenser and the power transformer. Its use is to cut out the hearing aid when local room noise interferes with the enjoyment of the radio program. It will be found that this switch will not stop the hearing aid immediately; the cathode of the 79 tube requires perhaps thirty seconds to cool down after the filament power is cut. When the switch is turned on, the 79 will heat up and start to operate in much less time.

The wiring diagram, Figure 1, must be followed closely, and all filtering included, as shown.

The filtering shown is the minimum required. The writer uses the point-to-point method of installing the 79 tube resistors and condensers, allowing them to be supported by their own leads.

The bias for the 79 tube is obtained from the drop in the 250-ohm section of resistor R2, which is filtered by the 10-mfd., 25-volt tubular dry electrolytic condenser, C2.

To mount the microphone, purchase a one-dollar Gilbert alarm clock and remove the mecha-



TOP VIEW OF CHASSIS

The parts which were added are marked; note the construction of the shield for the 79 tube

nism, drill two holes for 8-32 mounting screws in the bottom of the case, for mounting, and also a $\frac{3}{8}$ -inch hole to pass the microphone shielded connecting cable. This $\frac{3}{8}$ -inch hole is drilled through inside the base of the case so the cable will not be visible when mounted. Drill one hole through each of the sides and the top of the clock case for screws to hold it together after the microphone is installed.

To mount the microphone, use a Mason jar opener made by Auburn Rubber Corporation. Cut a hole $1\frac{1}{2}$ inches in diameter in the center of the opening and a notch $\frac{1}{2}$ inch square in the side. This can be slipped on the microphone with the notch fitting over the boss of the microphone case through which the cable is brought out.

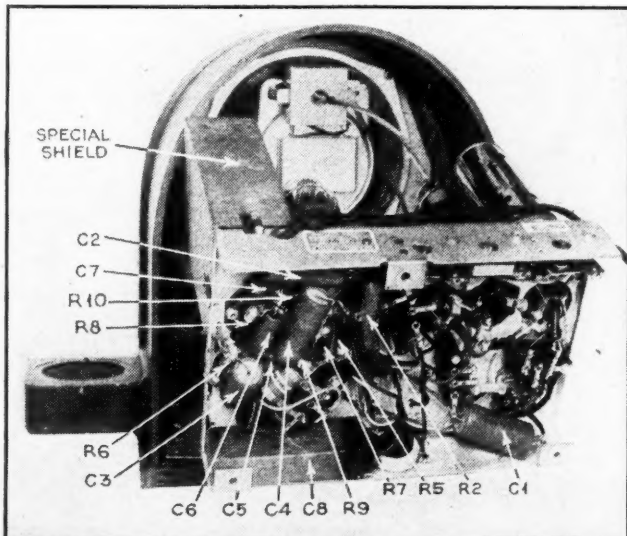
Installing Microphone

Lay a disc of $\frac{1}{2}$ -inch thick by $3\frac{3}{4}$ -inch diameter sponge rubber (cut out of a kneeling pad) in the back of the clock case, pass the microphone connecting cable through the hole and lay the microphone on top of the rubber. Lay a piece of thin ornamental cloth over the microphone, then place a $\frac{1}{8}$ -inch-thick bakelite or hard rubber ring with a $2\frac{1}{4}$ -inch hole and $3\frac{3}{4}$ inches in outside diameter, on top of the cloth. Replace the clock case front and hold it in place with three 6-32 by $\frac{1}{8}$ inch long, round-head screws through the holes drilled in the sides and top.

Mount the clock case at the right-hand end of the radio cabinet in a horizontal position with the microphone facing up. This permits the telephone receiver to be placed on the microphone to amplify telephone conversations and does not interfere with the operation of a crystal microphone, as this type operates equally well in all positions.

Three holes are drilled in the side of the radio cabinet to permit the microphone to be mounted, two for the 8-32 mounting screws and one, $\frac{3}{8}$ inch in diameter, to pass the microphone cable. The insulation on (Turn to page 763)

VIEW FROM BELOW





PRACTICAL RADIO CONSTRUCTION

There is no better way for the beginner to study radio than to "learn by doing." The receiver shown here is the one described in this article

THE little receiver described last month employed a vacuum tube as a diode detector. The present article will be devoted to describing minor changes in this receiver so as to employ the same tube as a much more efficient detector, providing louder signals and reception from greater distances. Before proceeding it will be best to review briefly the action of a vacuum tube.

A vacuum tube consists of a closed bulb of glass or metal wherein several metallic elements are placed. The simplest type ("diode") has two such metallic elements, a filament and a metal plate. When the filament is heated, electrons—the smallest known negatively charged particles—will be thrown off the filament wire. The heating of the filament is to no other purpose than to obtain a source of free electrons in this manner.

What happens to the electrons? When enough of these negative particles leave the filament, the filament itself becomes positive. When this occurs the electrons tend to rush back to the fila-

ment unless a stronger attraction is provided elsewhere in the tube. The entire action of a vacuum tube hinges on the controlled movement of these electrons. The presence of air hampers this movement and for that reason the air is pumped out of the tube during manufacture, hence the name "vacuum" tube.

The Diode Tube

When a metal plate is nearby, and the metal plate is insulated, some of the electrons will settle down on the plate until it becomes negatively charged, in which condition it will repel other electrons. If the metal plate is connected to the filament, the electrons which went to the plate will return to the filament because the filament is positive (lacking in negative electrons). Thus an electric current will flow from the filament, through the vacuum to the plate and then through the wire back to the filament.

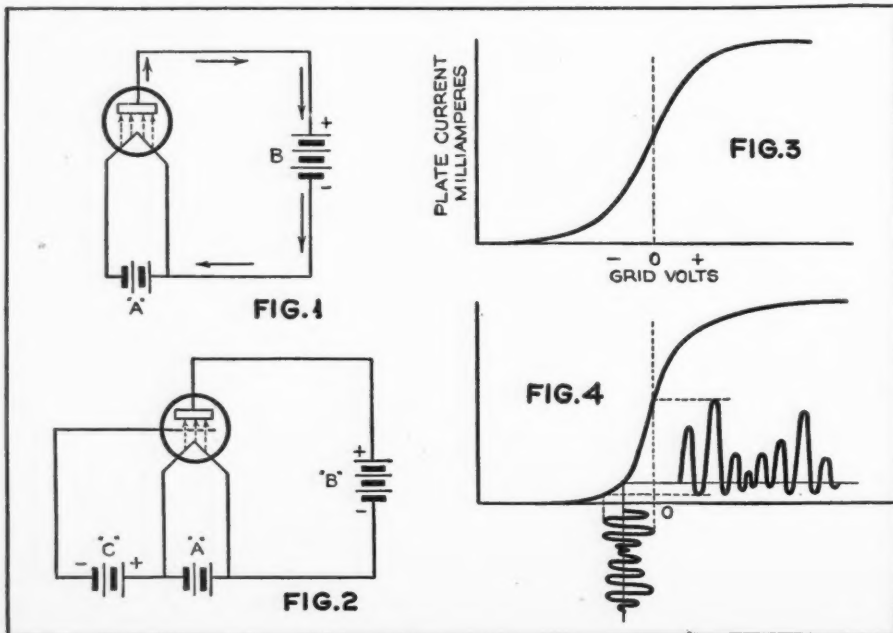
Suppose we go a step further and by inserting a battery, "B," between plate

and filament, make the plate positive with respect to the filament (Figure 1). Then the electrons will be attracted to the plate and pass through the battery and back to the filament. The current obtained in this way is much larger than without a battery, the amount depending on the voltage between plate and filament. If, on the other hand, the plate were made negative with respect to the filament (by reversing the battery connections), the plate would repel the electrons and practically no current would flow in the plate circuit. This type of tube is called a "diode" and is a device which conducts electricity in one direction only.

The first property is utilized in the use of such a tube as a detector (or rectifier). Since it conducts in one direction only, the negative half of an alternating voltage does not produce any current and alternating currents are therefore converted into direct current.

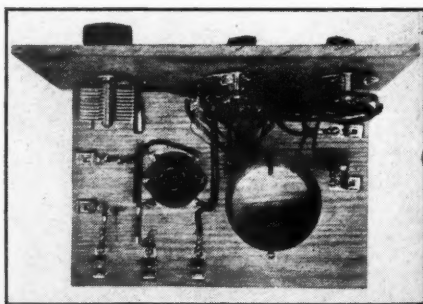
The Triode Tube

Introduction of a third element (making the tube a "triode") opens up new possibilities for the tube. When a "grid," consisting of a metal spiral or a mesh of wires, is placed between the plate and filament and the plate is made positive, it is possible to control the plate current by applying small voltages on the grid. This works as follows. Since the grid is much closer to the filament



ARRANGEMENT OF PARTS

This view shows the way the parts are laid out on the baseboard



and Instruction for Beginner

appeared in the May issue. It receiver circuit and operation of detectors. This month the opera- discussed in greater detail

V.T. Receiver

Borst

than is the plate, it has a greater effect on the electrons which are just emerging from the filament. When the grid is made negative, even a few volts, it may completely cancel the attracting power of the positive plate. On the other hand, reducing the negative voltage applied to the grid, will allow electrons to pass through the grid on their way to the plate. As long as the grid does not become positive, there will be no current in the grid circuit and it will take no power to control the larger power in the plate circuit.

To illustrate a tube's properties or characteristics the radio man resorts to

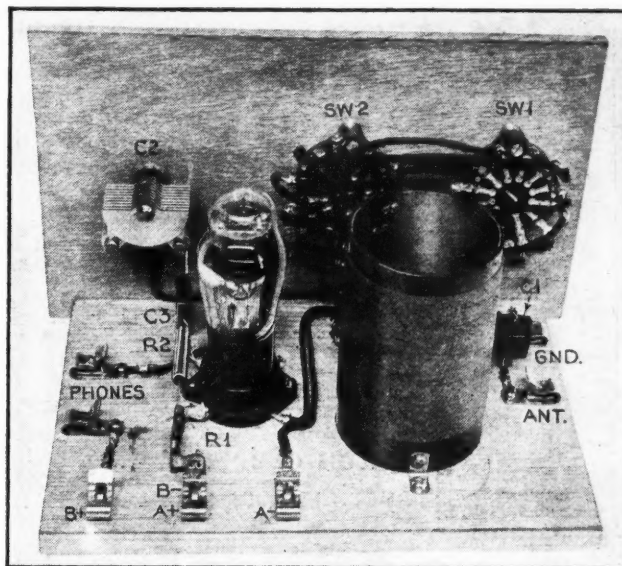
the use of curves. One such curve showing the plate current for different grid voltages while the plate voltage is constant, is shown in Figure 3. Note that there are two bends in the curve. The upper bend is present because there is a maximum "saturation" current which exists when all the electrons emitted by the filament are travelling to the plate. There is a different saturation current for each plate-voltage and each filament voltage, because a higher filament voltage will cause a greater emission and a higher plate voltage will exert a greater pull on the electrons, which is necessary to overcome the "space charge," which is a charge of the cloud of electrons themselves. This charge also limits the maximum plate current.

Plate Detection

There are several ways in which a tube can be made to detect (rectify). In the article last month we said that an ideal detector would be a device which is conductive only in one direction. However, a perfect detector has not been developed to date. Neverthe-

THE COMPLETE CIRCUIT

Figure 5. It is important that the beginner learn to read and understand schematic circuits such as this, as most published radio circuits are presented in this form



THE ONE-TUBE TRIODE RECEIVER

This is the completed model of the receiver described in this article. It is the same receiver described last month with minor changes which result in louder signals and greater sensitivity

less this rectifying action can be performed and utilized even though the rectifier is not perfect.

The most simple way to use a tube as a rectifier or detector would seem to be to give the grid a steady negative voltage (as in Figure 2) so that the operating point is on a sharp bend of the curve. Figure 4 illustrates what happens when a signal voltage is applied to the grid. While the grid voltage varies up and down, the plate current will go up and down too but it responds much better in one direction than in the other because of the bend in the characteristic. The plate current now closely resembles the rectified current as shown last month and this current when passing through the phones will reproduce the original sound.

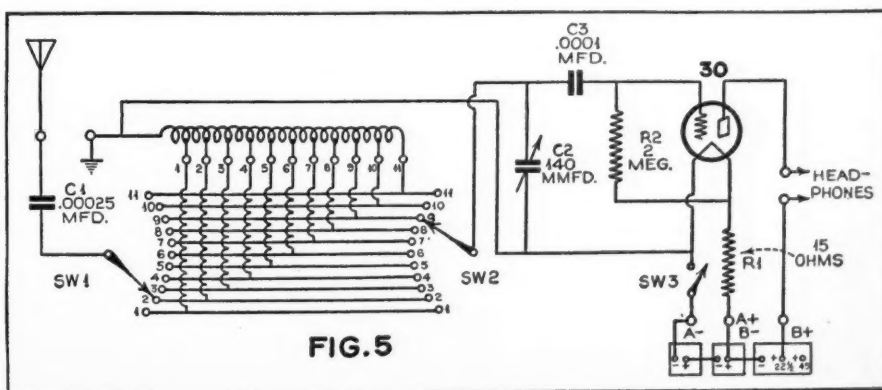
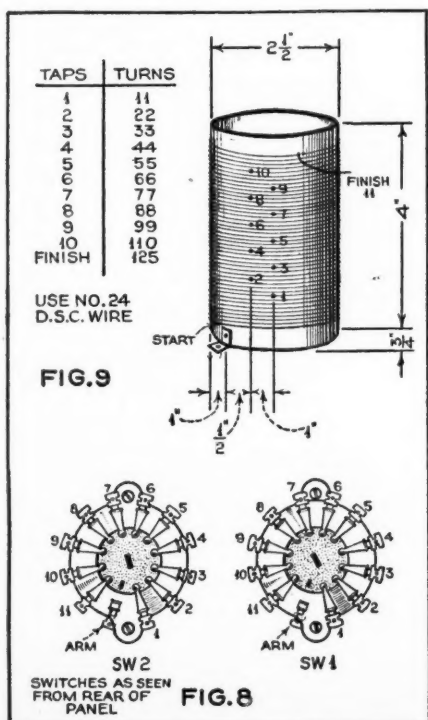
Grid Detection

The difference between the above described system and that of last month's system is that it is much more sensitive because the tube when used as a triode, serves as an amplifier as well as a detector. The increased power is supplied by the B-battery with the grid acting as a valve to control it, while in the diode system the received signal itself must supply the power for the phones.

There are, however, (Turn to page 764)

CONSTRUCTION DETAILS

Figures 8 and 9 are repeated from last month to provide information on the construction of the coil, and on the wiring. The numbers on switches and coil correspond with those in the circuit diagram of Figure 5



The RADIO WORKSHOP

Items of interest for beginners, experimenters and radio constructors.

Conducted by The Associate Editor

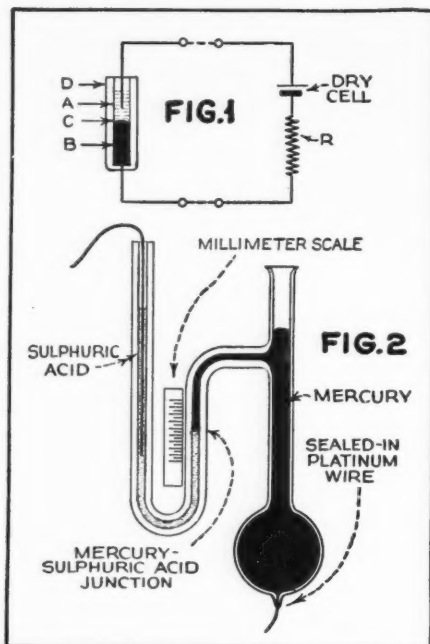
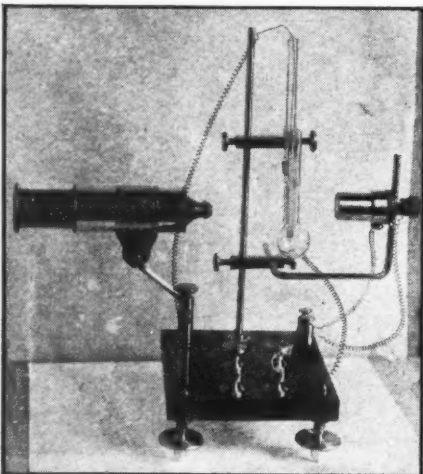
Ultra-Sensitive Capillary Voltmeter

Radio experimenters should find the capillary voltmeter described below a handy little instrument for measuring small changes in d.c. voltage. It is a simple device to build, and is inexpensive, the complete parts and materials costing about one dollar.

Many years ago a Professor Lippmann discovered the very interesting fact that when a difference in potential was applied to two different liquids in contact, there was a very noticeable tendency to affect the surface tension, especially when the action took place within a glass tube of very fine bore as in a capillary tube. A reference to the drawing in Figure 1 shows the liquids represented by "A" for a diluted sulphuric acid and "B" for the mercury, "D" is the glass tube and "C" the junction of the two liquids. The liquid columns and the junction are shown in series with a dry cell and a large resistance, which form the test circuit. The resistance is used simply to cut down the amount of current flowing from the cell.

When a current passes through the two liquids in this manner, the junction moves in proportion to the voltage applied. Thus a means is at hand for the measurement of very small differences in electrical potential.

The capillary electrometer tube shown in Figure 2 will cost about seventy-five cents. It comes all ready with a sealed-in platinum wire and may be purchased from Eimer and Amend, New York, N. Y., or any large drug supply company.



If you have a magnifying glass and a flashlight bulb around the shop, they can be mounted in line as illustrated in the photograph, so that the junction of the liquids may be seen clearly. It will be necessary to use the bulb behind a piece of frosted glass.

It is a simple matter to accurately calibrate the instrument. The scale of the standard electrometer tube is graduated in 1/10 millimeters and with such a scale, .001 part of a volt will move the mercury-sulphuric acid junction no less than ten scale divisions.

The scale can be very nicely cut into a flat piece of celluloid (the kind used on automobile curtains) by the aid of a good straight-edge and an old safety razor blade. After this, the marks made by the safety razor blade may be filled with white ink and permitted to dry. The scale is mounted beside the electrometer tube as illustrated in the sketch.

The sulphuric acid solution, of which but a small amount is needed, is produced by adding, very slowly, one part of sulphuric acid to ten parts of water. Only a very small amount of mercury will be needed, because the bore of the tube is very small. Warning—The sulphuric acid must be dropped into the water and it should be done very slowly—do not under

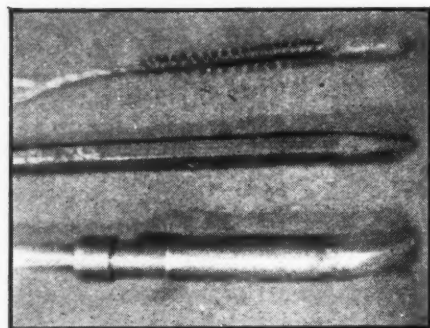
any conditions add the water to the acid. Use a glass rod for stirring. It will be obvious, of course, that the inertia of the mercury and sulphuric acid columns will not permit the device to be used in connection with alternating current. For direct current this little instrument may be used in any case where a simple, reliable voltmeter of great sensitivity is required.

The really ingenious experimenter could arrange the instrument in such a way that an image of the mercury-sulphuric acid junction would be thrown on the wall. This would add greatly to the utility of the device, since the reading could be observed without the necessity of peeking through the magnifier.

RAYMOND F. YATES,
Lockport, N. Y.

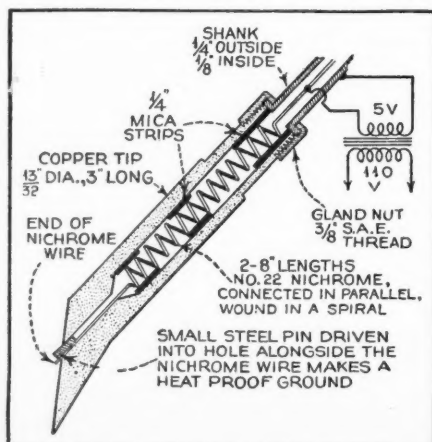
Home-Made Low-Voltage Soldering Iron

Here is a soldering iron kink that I think everyone will be interested in. Due to the delicate wire employed in the heating



element of 25 watt soldering irons, I have had the annoying experience in the last year of replacing three broken elements in my iron. I came to the conclusion that it was about time I replaced the element with a winding of heavier wire to work from low voltage. The accompanying sketch and photo shows my completed home-made iron working from a special step-down 5 volt, 10 ampere transformer. For small soldering jobs lasting only a short time, the iron can work directly from a 6 volt storage battery. The line connecting cord to the battery should be heavy enough to carry a large amount of current, something in the neighborhood of 6 to 10 amperes.

The following notes will be helpful in the construction of the iron. The heating element was made from two 8 inch pieces of No. 22 nichrome wire. The 2 pieces were wound on a 3/32 inch mandrel, forming a short, stiff, self-supporting spiral having an outside diameter of 3/16 inch. The tip was machined from a piece of 13/32 inch copper rod. The gland nut was machined from 3/8 inch cold rolled steel and screws directly on to the copper



Attention! Experimenters

THE "Radio Workshop" is a department which caters especially to the experimenter. Send your ideas, kinks and hints to the editor of this department, and wherever possible include a simple but clearly defined drawing or a photograph of the idea. All ideas published will be paid for at regular space rates.

tip. The photograph illustrates the small size of the iron alongside of the pencil shown in the middle of the photograph.

The finished iron weighs only a few ounces, heats up very rapidly and handles any light radio soldering job with ease.

O. SWANSON,
Spokane, Wash.

More Than One Use for Condensers

It is not generally known that a condenser can be used as a voltage-dropping device for lighting from one to several tubes directly from 110 volts a.c. line supply. This method has some advantages over the line-cord dropping resistor. It does not develop any heat and it saves power. The required capacity for a given tube can be calculated as follows. Suppose one 6.3-volt tube requiring .3 ampere is to be heated directly from a 115-volt, 60-cycle line. What is the size of the required condenser?

The total impedance of the circuit should be:

$$Z = \frac{115}{.3} = 383 \text{ ohms}$$

The resistance of the filament itself is:

$$R = \frac{6.3}{.3} = 21 \text{ ohms}$$

The required capacitive reactance is then:

$$X_C = \sqrt{383^2 - 21^2} = 372.4 \text{ ohms}$$

$$C = \frac{1,000,000}{2\pi f X_C} = \frac{1,000,000}{376.8 \times 372.4} = 6.96 \text{ microfarads}$$

The nearest commercial value, 7 microfarads may be used. It should be a paper condenser of at least 200 volts d.c. rating and the right capacity is important.

There is very little difference in the required capacity when another tube is to be added. Up to three tubes can probably be connected in series with 7 mfd.

With an 8 mfd. condenser in series you can light nine 6.3-volt type tubes operating on .3 ampere such as the type 39, 43, 44, 75, 77, 78, etc, or one 25Z5 and five ordinary tubes or one 25Z5, one 43 and one other 6.3-volt tube.

A single 2-volt .06-amp. tube requires 1.33 mmfd. Don't use electrolytics.

JOHN BORST,
New York City, N. Y.

Cutting Bakelite Tubing

In winding coils on various sizes of bakelite and hard rubber tubing I ran up against the difficulty of cutting the tubing straight. Previously I would saw it to the best of my ability as governed by arm and eye. Results in many cases were not so good and quite often necessitated additional work of filing or sawing.

I found the remedy in simply pasting a straight-edged piece of paper around the form to provide a guide line for the entire circumference of the tube.

RICHARD FEENEY,
New York City, N. Y.

Tells How It Feels to STUNT

By Stanley Kent

HOW a flyer maneuvers and how he feels when he does so is being told to airport crowds by Major Al Williams, noted aviator, while actually in the air by means of a novel arrangement of radio and loudspeaking equipment. The apparatus, employing ultra-high frequencies, is being used for the first time in an airplane.

Major Williams demonstrates difficult aerial maneuvers and explains them to the spectator below as he goes along. He has already given this demonstration at the Miami air races and is repeating it at other airports throughout the country. His plane is a Curtis-Hawk equipped with a Western Electric ultra-high-frequency radio transmitter and receiver of the type ordinarily used to equip police cars for two-way communication with headquarters.

The transmitter has a power of five watts and operates on 35.6 megacycles, compared to the standard aviation band of 3 to 6 megacycles. Williams has obtained from the Federal Communications Commission a special license which permits him to operate in this experimental band for educational purposes.

The ultra-high-frequencies enable him to use an extremely short antenna on his plane, a wire running from the back of the fuselage to the top of the vertical fin. It measures only six feet in length whereas the conventional airplane antenna is 35 feet long. His receiver is modified from the standard police type so that he can wear headphones as he twists and turns.

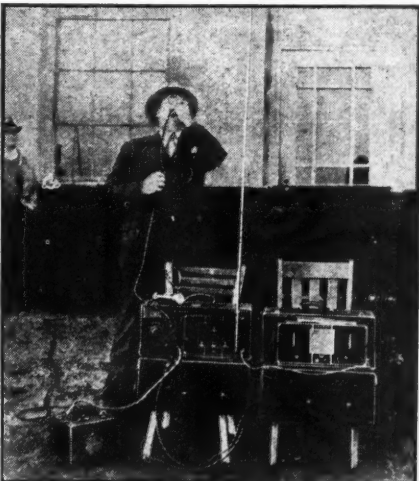
On the ground is located a similar transmitter, and a receiver of the type used in police headquarters or precinct stations. The antenna is a vertical steel rod about seven feet high, a so-called "fish-pole" antenna.

Once in the air, Williams converses with the announcer on the ground and both ends of the conversation are amplified out over the field by means of loudspeakers. For example, the announcer asks:

"Al, will you please do a dive ending with a vertical loop?" Williams replies: "I



MAJOR AL. WILLIAMS



PLEASE "DO A DIVE"

Announcer conversing with Major Williams from the field by means of portable ultra-high-frequency transmitter. The complete conversation is made audible to the spectators through the loudspeakers of a public-address system

am now 5,000 feet up. I push the stick forward and we go into a dive. I gain speed rapidly. I am now falling at a rate of 260 miles an hour and at about 500 feet above the field I pull back the stick slowly. We climb quickly then slower and finally by returning the stick to a neutral position we are now flying upside down."

Few, if any, channels are available in the longer wave bands, already crowded by a wide variety of uses. Ultra-high frequency radio waves travel in a straight path like light and are particularly efficient for the short-range operation required in Williams' demonstrations, during which he will always be within sight of the air field. Use of the ultra-high frequency channel demands extremely sharp tuning and all the units in Williams' radio equipment are crystal-controlled for this purpose.

New Use for a Knitting Needle

Here is a simple kink for a neutralizing or aligning tool. Obtain a hardwood or a bone knitting kneedle about 1/4 inch in diameter. The length is generally 12 to 14 inches, cut it down to about 6 inches, and then with the aid of a sharp knife or a razor blade, whittle the end (in the case of a wooden needle) to a screw driver edge. If a bone needle, it can be ground down. The latter type needle holds its edge better and was found to be best for this work.

FRANK McLAUGHLIN,
Jersey City, N. J.

Information for Changing Meter Scales

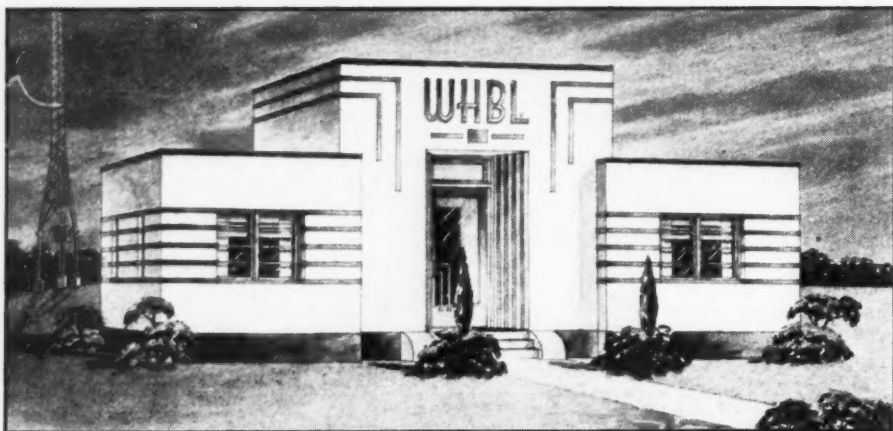
Recently I had occasion to change the range of a small meter, the divisions remaining the same but requiring new figures.

I successfully accomplished this and retained the original dial by applying a little carbona cleaning fluid on a cloth and rubbing it over the figures until there was no trace of the numerals. This should be done carefully so that the divisions are not erased. The new figures can be penned in with black India ink.

A. R. DAYES,
Brooklyn, N. Y.

Pepping Up Old TRF Sets

I offer the following successful kinks to my fellow experimenters for improving old tuned radio-frequency receivers. First, I remove the primary windings from the r.f. coils and substitute for them, r.f. chokes with an inductance value of from 40 to 80 millihenries, depending upon the particular type of tube employed. The chokes are mounted inside the coil forms as shown in (Turn to page 761)



THE DX CORNER

S. GORDON TAYLOR

(For Broadcast Waves)

THE "Best Bets" list which appears in this department monthly during the DX season is this month being discontinued for the summer. The "DX Calendar" is also much reduced in size, which is natural. During the summer months the DX Corner will be devoted largely to quotations from Observers' reports, including items of personal interest, dope on station changes, etc. Observers are particularly invited to send in information of this nature.

Readers desiring appointment as Official Broadcast Band Listening Post Observers would do well to take advantage of the summer slack to send in their applications so that they can be appointed and be "all set" when autumn rolls around and the broadcast band once more opens up for real DX reception. Address applications to the editor of this department and in your letter of application include a brief summary of your DX accomplishments and tell what equipment you are using. There are no dues and no other obligations involved except an agreement to submit a monthly report, if appointed, of your best DX catches and including information which will be of interest to other DX listeners.

Radio Clubs—Attention!

On behalf of the New Zealand DX Radio Association, Observer Eric W. Watson, 37 Chancellor St., Shirley, Christchurch N-1, N. Z., extends an invitation to DX and short wave clubs throughout the world to forward particulars of their clubs to be published in "Tune In", the monthly magazine of this New Zealand club. In return would like to have particulars of his club published in the bulletins of other clubs. These particulars were given in some detail in the DX Corner of the January, 1936, issue of RADIO NEWS, pages 407, 408 and 439.

Observer Watson would also like to carry on personal correspondence with Official Radio News Listening Post Observers, particularly those in Switzerland, Sweden and South America. He will be particularly interested in correspondence concerning DX and amateur activities. He also specifies that he will answer all letters received from either sex.

The recent special broadcast from KNX dedicated to New Zealand DX'ers was heard well in New Zealand although static blurred the latter part. The voice of Mrs. Dora Newcomb, Californian representative of the NZDX Radio Association, was clearly heard—not without a thrill of pride by the officials at the Association's headquarters.

DX Calendar

The DX broadcasts listed below are those which are expected to continue at least to the end of May according to replies received to inquiries sent to the stations. Most of them are expected to continue throughout the summer although, of course, there may be some changes in present plans. The times given are Eastern Standard Time. If readers of this department desire that these programs be continued throughout the summer it will be helpful if they will

write to the stations listed asking that the programs be continued.

Thursdays— 8:30-9:30 p.m.	1420 kc., KCMC, Texarkana, Ark., 1 kw. (Radio News) (tips)
Saturdays— 12:01-12:30 a.m.	980 kc., KDKA, Pittsburgh, Pa., 50 kw. (tips)
5-6 a.m.	1370 kc., WMFO, Decatur, Ala., 1 kw. (NNRC)
7-8 a.m.	1210 kc., WSBC, Chicago, Ill. 1 kw., (NNRC)
Sundays— 1 a.m.	640 kc., KFI, Los Angeles, Calif., 50 kw. (tips)
1-1:15 a.m.	1420 kc., KGGC, San Francisco, Calif. (Radio News) (tips)
Monthly— 1-2 a.m.	815 kc., CMCF, Havana, Cuba, .25 kw. (11th & 21st each month)
1:30-2 a.m.	1060 kc., WJAG, Norfolk, Neb., 1 kw. (tips) (2nd Friday)
2-2:20 a.m.	1420 kc., WJBO, Baton Rouge, La., 1 kw. (Radio News) (2nd Saturday)
2-4 a.m.	1420 kc., WJBO, Baton Rouge, La., 1 kw., (1st Sunday)

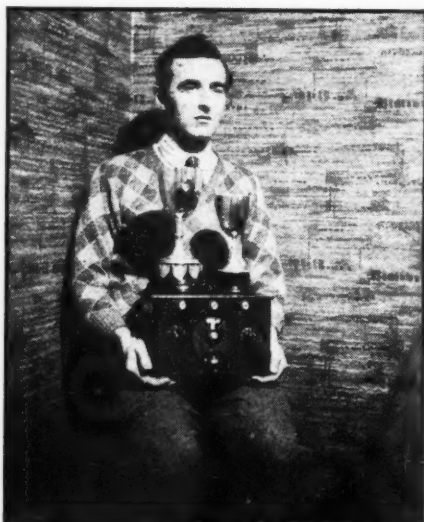
Our Readers Report—

Observer Tyndall (Burlington, Vt.): Am pleased to say that the verification just received from KDON makes my total verifications an even 1300. The season is nearing the close but I still hope to hear a few more mornings' decent DX before hanging up the phones.

Observer Kalmbach (Cheektowaga, N. Y.): Reception conditions have been terrible recently

A BRITISH OBSERVER

Official L.P.O. Coales, Southsea, England, holding his version of the "R.N. Tenatuner". Atop it is (left) cup earned by Observer Coales as winner of the British I.D.A. Summer S.W. Contest, 1935. The smaller cup he won at cricket



WHBL'S NEW STATION

WHBL will soon put a new transmitter on the air to replace the present one. The new transmitter house is shown at the left. The latest R.C.A. 500-watt equipment will be used for full-time operation on 1410 kc.

AN ILLINOIS L.P.O.

(Right) D. Floyd Smith, Greenville, Ill., works at the building construction trade when he can spare time from his DX activities

Official RADIO NEWS Broadcast Band Listening Post Observers

United States

Alabama: Ray Wood
Arkansas: James Halsey
California: Eugene S. Allen, Frank D. Andrews, Roy Covert, Bill Ellis, Henry Evansmith, Randolph Hunt, Walter B. McMenamy, Radio Fellowship, George C. Sholin, Warren E. Winkley
Connecticut: Fred Burleigh, James A. Dunigan, Stanley Grabowski, Joseph J. Mazel, R. L. Pelkey
District of Columbia: Geo. Day Cockrell, Jr.
Illinois: Herbert H. Diedrich, H. E. Rebensdorf, D. Floyd Smith, Raymond S. Swenson, Donald C. Truax
Indiana: Earl R. Roberts
Iowa: Donald Barnes
Kansas: Dudley Atkins III, T. R. Grosvenor, Vernon Rimer
Louisiana: Aubrey V. Deterly, Wilbur T. Golson
Maine: Danford Adams, Floyd L. Hammond, Roger Williams
Maryland: William L. Bauer, Louis J. McVey, William Rank, Frank Zelinika
Massachusetts: William W. Beal Jr., Walter C. Birch, Russell Foss, Simon Geller, Warren C. Reichardt, Evan B. Roberts
Missouri: M. F. Meade
Minnesota: Floyd Biss, Walter F. Johnson
Mississippi: Mrs. L. R. Ledbetter
Montana: R. W. Schofield
Nebraska: Bud Crawford, John Havranek
New Jersey: Robert F. Gaiser, Morton Meehan
New York: Jacob Altner, Murray Buitenkant, Paul J. Crowley, Ray Geller, Edward F. Goss, John C. Kalmbach, George J. Karesh, Harry E. Kentzel, Maynard J. Lonis, Harold Mendler, Robert C. Schmarder, R. H. Tomlinson, William Wheatley
North Dakota: O. Ingmar Oleson
Ohio: Stan Elcheshen, A. J. Parfitt, Donald W. Shields
Oregon: David Hunter
Pennsylvania: Robert W. Botzum, Stanley Brus, Robert H. Cleaver, Harry M. Gordon, Edward Kocsan, Warren Routzahn, Francis Schmidt, Joseph Stokes, Paul V. Trice
Rhode Island: Spencer E. Lawton
South Dakota: Mrs. A. C. Johnson
Texas: Isaac T. Davis, Thomas H. Housenfluck, E. L. Kimmons
Vermont: Henry T. Tyndall, Jr.
Virginia: C. C. Wilson
Washington: W. Russell DuCette, Jack Staley
West Virginia: Clifford Drain

Foreign

Alaska: S. A. Tucker
Australia: Albert E. Faull, George F. Ingle, Aubrey R. Jurd
Canada: Bernard J. Clancy, John W. Ker, Ernest W. Law, Art Ling, Philip H. Robinson
Cuba: Rafael Valdes Jimenez
England: R. T. Coales, F. R. Crowder, Charles E. Pellatt, J. S. Phillips
Germany: Reginald Pick
Japan: A. T. Yamamoto
New Zealand: Alexander N. Chalmers, L. W. Mathie, R. H. Shepherd, Eric W. Watson
South Africa: A. E. Lyell
Switzerland: Dr. Max Hausdorff
Turkey: A. K. Önder



with static R9 and signals weak. This season has been very poor as compared with the 1934-35 season. This season I have added only 75 stations as compared with 250 last year. WBNY now operating on a regular schedule 10 a.m.-2 p.m. and 3 p.m.-midnight daily.

Observer Lonis (Hannibal, N. Y.): Of the TP's, 1YA and 4YA have been putting in the loudest signals. These two together with 2CO have been the most consistent.

Observer Schmarder (Syracuse, N. Y.): Recent reception has been rather poor and except for the F.C.C. frequency check schedules no important DX has been heard. Chalk up another complete state for my log. On March 13th I logged KOH of Reno, Nevada, the only station not previously heard in that state. Our local WSYR has found a location for their new transmitter and will boost their power to 1 kw. on or about June 1st.

Observer Crowley (Rochester, N. Y.) found DX conditions during March much more favorable than did many other DX'ers. He succeeded in logging 16 European stations and 5 South Americans during this month. He reports further, "XER now utilizes 300 kw. and to the best of my knowledge still does not verify. The signal is so strong in Rochester that the nearby Canadian, CRCT is sometimes pushed right out of the picture. Can anybody tell me what Spanish-speaking station operates on 917 kc.?"

Observer Wheatley (New York City): I was fortunate enough to pull in LR8 on their DX for the GCDXC on March 15th and sent them a report. Verifications in from LR1, and LR4, the latter being only a Thank You Card. Why don't stations wake up to the fact that when a DX'er writes for a verification, he expects one, not a Thank You Card or letter. LR1 can be heard every night behind WTAM and LR4 can be heard for 5 or 10 minutes after WBZ signs off. The TA's seem to have disappeared entirely and according to reports the TP's are beginning to put in their signals, although the only one heard here was 4YA.

Observer Goss (New York City): Transatlantic reception is practically dead now, with only occasional faint signals from Fecamp on 1113 kc. Transpacific stations are not showing up as well as last spring. Of these 1YA and 4YA are the best, but even these are seldom good enough to copy. The South Americans have been heard rather well at times in the early evenings, particularly LS4, 670 kc.; LR6, 870 kc.; PRE3, 1225 kc. and PRF4, 1222 kc. Others heard occasionally include LR5, LR1, LS2, TIPG, 625 kc., Costa Rica, is heard regularly.

Observer Altner (New York City): DX signals have been strong but Old Man Static never seems to let up. XEWZ, 1150 kc. is on every Sunday from 2 to 5 a.m. EST. CMBX, 1080 kc. is on 1 to 5 a.m. every Sunday. WHIS, 1410 kc. is on every Sunday after 2 a.m. My log now stands at 582 stations verified.

Observer Tomlinson (Port Chester, N. Y.): Have been having trouble hearing TP's due to a leaky street circuit nearby. In spite of this one morning I was able to hear KGMB, 4YA and 3GL. TA's are dead although during the second week of March, due to some freak conditions, they were all over the dial during the early evening but not a peep in the early morning. Verifications recently received: HAE2, 1250 watts, Hungary; CX34, 500 watts, Uruguay; Koenigsberg, 2 kw., Germany. HHK is on 915 kc. instead of 920 and is heard well at 8 p.m. EST Fridays.

Observer Kentzel (Averill Park, N. Y.): I recently received my rarest broadcast band verification. This is from CNR, Rabat, Morocco, 601 kc. I heard and reported their special of

(Turn to page 761)

This NEW Type of RADIO TRAINING

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Industry in the World

Here, at last, is a NEW and DIFFERENT type of Training that not only teaches you all phases of Radio Service Engineering work—but which equips you for an actual start in business. No matter what kind of Radio training you may take, you will require such materials before you actually are ready for business. Sprayberry Training gives them to you—teaches you to work with them under actual Service conditions.

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THIS COMPLETE SERVICE ENGINEERING EQUIPMENT IS YOURS!

Upon completion, you have both the knowledge and equipment to enter business then and there for full or part time profits—or to start out in any one of Radio's specialized fields such as sound, broadcasting, etc. Certainly you owe it to your future to investigate—TODAY!

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Without cost or obligation on my part please rush complete details of your new type of training and the booklet, "MY FUTURE IN RADIO."

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JACKSON MULTI-METER

YOU NEED THIS LOW COST METER

Sensitive—Accurate—Compact



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Voltage range: 0 / 5 / 50 / 500 / 1000.
Resistance range: 0 / 1000 / 0-500,000 ohms—readings as low as 1/2 ohm. 0-1 milliamperes, D'Arsonval movement, with zero corrector. Size, 5" x 3" x 2".

**MODEL 412
UNIVERSAL
RANGE
D.C.**

Ideal for serviceman on the job. Performs 80% of necessary receiver chassis measurements. Compact size enables quick checkup right beside chassis. The perfect unit for the Service Shop or Laboratory. Excellent range for Auto Radio Installations or Service.

The Amateur will find complete ranges for adjusting grid bias, screen, and plate voltages. Excellent for checkup on Xmtr. Ideal for quick checkup on Amplifiers in P. A. Systems. Also suitable for Farm Radio installations, in fact never before have so many features appeared in such a low cost meter.

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Backstage in Broadcasting



PATTI
CHAPIN



LANNY ROSS AND WINIFRED CECIL



ALEXANDER
GRAY

At Home and Abroad

By Samuel Kaufman

DURING radio's earlier days, many pioneers in the game predicted that Florenz Ziegfeld, the Great Glorifier of the stage, would develop into a master broadcasting showman. Before his death, the creator of the famous "Ziegfeld Follies" did bring a series to the air and, to this day, it is remembered as an outstanding job. And now, the new series entitled "The Ziegfeld Follies of the Air," on CBS Saturdays, well lives up to the high standards of showmanship set by the man it's named after. The full hour program, sponsored by the makers of Palmolive Soap, replaces the "Beauty Box Theatre" musical comedy adaptations. The new program stars Fannie Brice, noted Broadway comedy star; Benny Fields and Patti Chapin, two of the best-known radio vocalists, and Al Goodman's Orchestra. There are also occasional guest stars. In addition to comedy and music, a serialized drama is worked into the program.

WINIFRED CECIL, the new leading lady of Lanny Ross's Maxwell House Show Boat program (NBC, Thursdays), although a newcomer to the American airwaves, has a record of European concert achievements that classifies her as a star of long standing. A native American, Miss

Cecil studied at the Curtis Institute of Music in Philadelphia and with prominent tutors in Europe. She did radio and concert work abroad, earning popular followings in England, France, Germany and Spain. Lanny Ross chose her for the leading feminine rôle of his series after auditioning many talented young singers.

BBRITISH short-wave transmissions have done quite a lot towards establishing some London performers on a par with our own radio headliners in the estimate of American listeners. So much so, as a matter of fact, that we now find four former B.B.C. stars in the U. S. A. appearing on our own networks. They are Ray Noble, the orchestra leader, and Al Bowlly, vocalist, both on the CBS Coca-Cola program; Jack Hylton, another baton wielder, on CBS for Standard Oil of Indiana and NBC for Realsilk hosiery, and Beatrice Lillie, the comédienne, who is a frequent guest star on both networks. How long will it take before some more of the B.B.C. stars will be enticed over here by the lure of a fat salary from a sponsor? Just as Hollywood seems to land the best of for-

eign movie names for the American film studios, the American chains are striving to corner the world market on radio entertainment. When will alert American sponsors try to import Henry Hall, Charlie Kunz, Harry Roy and Carroll Gibbons—all top-notch dance conductors—and John Tilley, comedian?

AALEXANDER GRAY, the stage and screen baritone, who has been absent from the network schedules for a long time, has returned in a blaze of glory as star of one of the ether's new hit programs, the Chrysler "Airshow" on CBS, Thursdays. He shares billing honors with Charles Hanson Towne, the columnist, who serves as a commentator, and Mark Warnow's concert orchestra. A clever commercial twist has been injected into this automobile-sponsored show by naming the male octette the "Chrysler Eight" and the female sextette the "Chrysler Six." Gray was a protégé of Florenz Ziegfeld and appeared in many Broadway stage successes before going to Hollywood.

MISS BIDU SAYAO, Brazilian coloratura soprano and radio favorite of both South America and Europe, recently visited New York and, between concert

BEATRICE LILLIE



Heard Across the Seas

BIDU SAYAO



JOHN TILLEY





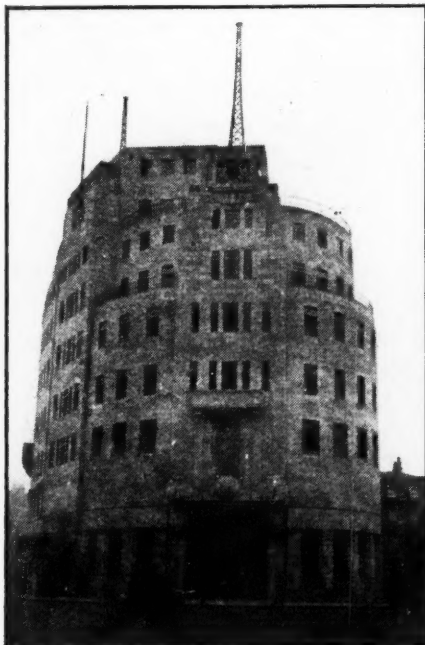
EDDIE DOWLING AND
RAY (MRS. DOWLING) DOOLEY

engagements, found time to appear on station WOR, Newark. She returned to Paris for a spring engagement at the Opera Comique and, following a summer visit to Brazil, expects to return to the U. S. A. Though still in her twenties, the Brazilian radio artist has appeared in the leading opera houses of France, Italy, Spain and Brazil.

ANOTHER famous "Mr. and Mrs." team has been added to the radio stellar line-up. This time it's Eddie Dowling and Ray Dooley, who, along with Burns and Allen, Block and Sully, Jack Benny and Mary Livingstone, Fred Allen and Portland Hoffa, rank as one of the hit husband-and-wife radio teams. Dowling and Dooley, 'tis claimed, originated the modern heckling type of humor. They've been noted stage headliners for years. Their series is heard on NBC Tuesdays, sponsored by the Elgin National Watch Company. Benny Goodman's orchestra and Helen Ward, songstress, also

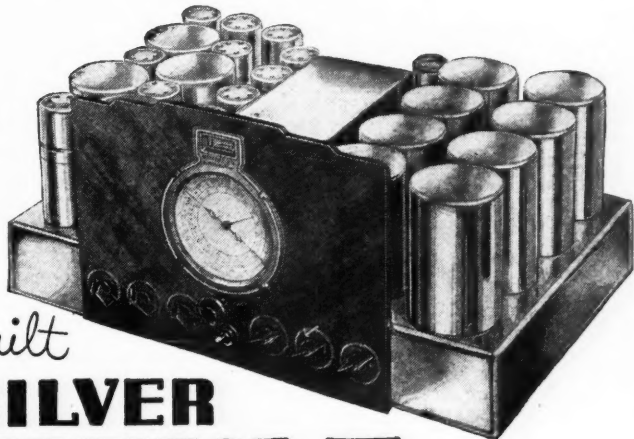
(Turn to page 749)

BROADCASTING HOUSE,
LONDON, ENGLAND



Quietness

... 10 to
100 times
LESS Tube and
Circuit Noise
in the
HIGH-FIDELITY
ALL-WAVE
WORLD-WIDE



Custom Built SILVER MASTERPIECE IV

● Quiet beyond belief! ... that's why experienced listeners, technicians and engineers use the 1936 MASTERPIECE IV for critical all-wave reception. Its exclusive TWO tuned r. f. amplifiers—of extraordinarily high gain—eliminate completely the oscillator noise of other radios.

That's why MASTERPIECE IV brings in weak and distant stations that other receivers cannot catch ... brings them in loud and clear ... with tone quality and fidelity so thrilling that, once you have heard it, you will never again be satisfied with anything less than the MASTERPIECE IV.

Finest Laboratory Construction

Custom-designed, custom-built, every set laboratory adjusted to the most exacting precision standards ... this champion distance-getter, this superb musical instrument, brings you every worthwhile feature of advanced radio engineering—many of them exclusive in the MASTERPIECE IV. Truly, it has every right to be termed the "Rolls Royce" of Radio!

New Tube Equipment

The 1936 MASTERPIECE IV is equipped with eight-pin sockets which take either the new octal-based glass or metal tubes. New 19-tube equipment gives a total of 27 separate tube functions. Its extraordinary inherent quietness, tremendous selectivity, sensitivity and reserve power, its unlimited distance range and un-

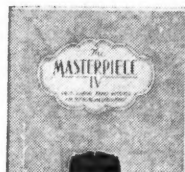
equalled clear tone make MASTERPIECE IV the outstanding choice for superior foreign reception.

New Low Prices ... Easy Terms

The new perfected MASTERPIECE IV is now offered at the lowest price in its history. New, liberal time-payment plan enables you to enjoy it NOW ... and pay for it out of income. Check the coupon for details.

Try it for 30 Days

Try the new MASTERPIECE IV for 30 days in your own home or laboratory, under your own reception conditions. If it fails to PROVE its ability to outperform any other all-wave receiver, at any price, return it to our laboratory undamaged and get your money back.



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☐ Send Free "Blue Book" giving complete specifications of MASTERPIECE IV with details of 30-DAY TRIAL.

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National Schools, Los Angeles, offer full instruction in Electricity, Television, Radio, Talking Pictures and Commercial and Broadcast Operating. National's all-inclusive course qualifies you for a successful, profitable future in the actively growing fields of Electricity, Radio and Television. Training meets U. S. Govt. license requirements. Earn room and board while learning. Coach R. R. fare allowed to L. A.



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Does away with slow hand work. Plugs in any light socket, A. C. or D. C. 110 v. 13,000 r. p. m. For home, shop or take to job. Uses 200 different accessories ... grinds ... polishes ... routs ... drills ... cuts ... carves ... sands ... saws ... sharpens ... engraves.



Order on our Ten-Day Money-back Trial ... or send for FREE Catalog.

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New CRAFTSMAN Project Book

"Pleasure and Profit with a Handee." Easy working plans for making many interesting and unusual projects 25c, stamps or coin.



RCA SPIDERWEB ANTENNA CATCHES ALL SIGNALS

12 to 2100 and 4 to 2100 meters

Here is the first truly all-wave antenna, multiple-tuned to all bands, with built-in coupling transformer that automatically selects the proper segments for the desired band. Provides a tremendously increased signal to the receiver, reduces noise on all short wave bands, and brings in stations you have never heard before.

The RCA Spiderweb Antenna comes complete, all connections soldered, ready to erect. Requires a span of only 38 feet, clearance of 12 feet. Stock No. 9685, 12 to 2100 meters, \$8.95. Kit Stock No. 9689, extending range to 4 meters, making 5 antennas in 1, \$1.50. Write for details.



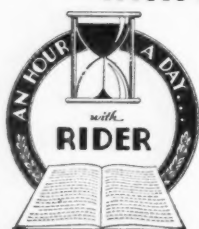
SPIDERWEB ANTENNA

RCA Parts Division

RCA MANUFACTURING CO., INC.

Camden, N.J. A Service of the
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"SURE, I'LL SPEND AN HOUR A DAY WITH RIDER!"



I've studied radio, but there's so much new stuff and so much I've forgotten that I must do something to catch up with the times."

ALTERNATING CURRENTS IN RADIO RECEIVERS

Book No. 1

How and why the components of a set function with a clear explanation of a-c. principles and practice.

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What happens when you align a receiver and the correct way to do it. All the types of resonant circuits that should be understood by the Serviceman.

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A clear explanation of how the networks that supply operating voltages to tubes function, and how the sizes of the resistors are calculated.

AUTOMATIC VOLUME CONTROL

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The functioning and servicing of all the new circuits that come under the head of automatic volume control. Handy pocket size—64-80 pages—Hard cover—Profusely illustrated.

Sixty cents each book.

Buy them from your jobber.—

**"AND I've got ALL SIX
RIDER MANUALS"**

THE SERVICE BENCH

tells YOU Something about

Summer Lines

...

Eliminating Noise

...

Wholesale Racket

...

Service Sales



FIGURE 5

Conducted by Zeh Bouck, Service Editor

BEATING THE "WHOLESALE" RACKET

There are few servicemen dealers who are not confronted with the problem raised by the fact that their customers can purchase radio parts and sets at prices far below the list prices which persons not associated with the trade are supposed—and rightly so—to pay. We feel that the following advertisement, of Becker's Music Shop, Philco distributors for Evanston, Ill., sums up the situation and at the same time offers a solution that will be well worth study by every radio serviceman!

AN OPEN LETTER TO RADIO BUYERS

About one-half of Evanston's families have "wholesale" connections—the other half buy at "retail." So if you buy a radio through retail sources, almost invariably someone will say, "Gee, I could have got it for you wholesale." "Wholesale" connections are remarkably plentiful and convenient, it seems. But buying "wholesale" often costs more than buying retail, especially in radios, automobiles or refrigerators.

If you prefer to buy at wholesale prices, you need not buy outside of Evanston. And the privilege is extended to everyone. Right here at 801 Dempster Street you may buy any radio at 25% to 40% off list! Our profit on this basis is very slim, of course. The extra bonus we receive for large-volume purchases and cash discounts constitutes our profit. But frankly, we'd prefer to sell on this basis. As with any "wholesale" purchase, the seller is relieved of a lot of responsibility. There are no liabilities. No grief and bother at the seller's expense if things go wrong, as they often do. It is for you to choose whether you wish to pay wholesale prices or retail prices—and since we sell you either way, we want you to know that we are a "two-price store." An explanation is in order before you can decide which plan is the more desirable—

The Wholesale Way

If you buy the "wholesale" way:

1. Your guarantee is limited to the manufacturer's guarantee on defective parts.
2. Defective tubes or parts are replaced free during the 90-day guarantee period, but service is charged for.
3. Radio is not subject to exchange. It must be accepted as shipped from the factory. No trade-ins are allowed.
4. Terms are arranged only on a restricted basis.
5. Noise reducing antennas and installations are charged for—which, if properly

done, with full equipment and lightning protection may cost from \$12.00 to \$20.00. 6. No free calls are made. Adjustments, replacements are all charged for.

However, if you prefer to buy the retail way, you receive the following benefits—

1. A generous allowance is made for your old radio. Radio parts, tubes, etc., are guaranteed unconditionally for six months. Service is free—day or night—and you are assured service by experts the day called.
2. We install without charge and without skimping, complete noise reducing antennas, etc., with any radio that lists for \$75.00 or more (standard aerials on lower priced receivers).
3. Each radio is tested and checked before delivery. It is balanced to highest efficiency—or rejected if it cannot be made to perform at maximum.
4. Exchange privileges if radio selected is not so suitable in your location as some other model. Foreign reception at its best—WITH FULL AUDIBLE VOLUME guaranteed. We give all the time necessary to instruct you in short-wave tuning.
5. Terms to suit—at lowest possible rates.

So there we have explained frankly the difference between two ways of buying your next radio. You may buy it wholesale or retail. Buy your next radio here with confidence—wholesale or retail. Sincerely yours, BECKER'S MUSIC SHOP. (We think that tells the story. Put it up to your own customers the same way!—Editor.)

THE DAY'S WORK

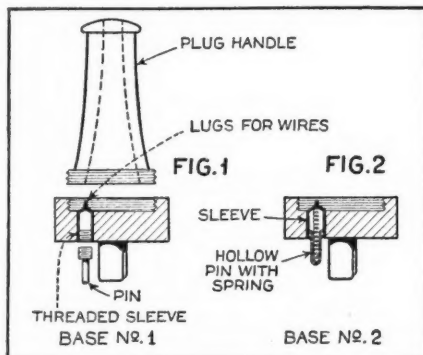
A group of radio manufacturers have recently agreed to discontinue the use of "blanked out" octal sockets. But the radio serviceman for many years to come will be confronted with the problem encountered in testing such receivers. Boring through the blanked holes, or carrying along a truck-load of adapters have been alternative solutions to the difficulty. However, William Dickering, of Vancouver, B. C., sends us the sketches of Figures 1 and 2, which describe a universal plug.

Both bases are drilled for the full com-

-“WINDOW AND COUNTER” CONTEST

RADIO NEWS is offering five cash prizes of \$10.00, \$5.00, \$4.00, \$3.00 and \$2.00 every month for photographs of interesting *window* and *counter* displays in service shops—and retail stores, in which radio service is a part of the business. While establishments of any size may be entered, RADIO NEWS will be partial to the successful small enterprise and the “up-and-coming” one-man business. Photographs of window displays are best taken with plenty of light on the display side of the glass, but shielded from the lens, care being observed to station the camera so as to reduce as far as possible reflections from across the street. However, photographic excellence will be subordinated, in this contest, to the quality of the display itself. Send in your contribution with a description of the display, and, if possible, an informal snapshot of yourself, to—

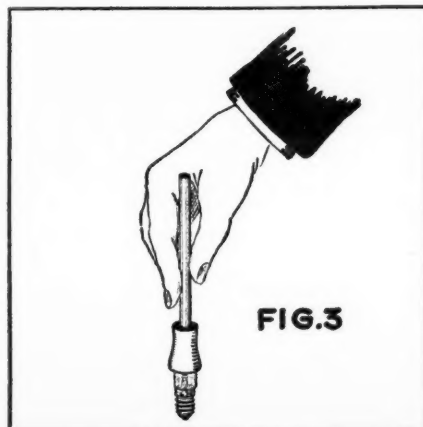
Yours for better servicing,
—The Service Contest Editor.



plement of octal pins. Base number 1 is the easier to construct. Threaded sleeves are inserted into the holes, and the required number of pins are screwed into the correct holes. Base 2 presents a somewhat more complicated construction, but its use is simplified. Hollow pins, with internal springs, are inserted in each hole. Pins hitting the blanks are forced up into the base, while those over the socket holes insert themselves to make contact. Fairly strong springs should be used.

Getting at Those Pilot Lamps!

"Here is a kink for the serviceman who has scraped his knuckles, to the accompaniment of profanity, in fishing for pilot lamps. The illustration of Figure 3 is



almost self-explanatory. The handle consists of a convenient length of pencil. Wrap a piece of Goodyear inner tube patching, $1\frac{1}{4}$ " by $1\frac{1}{4}$ ", around the end of the pencil, so that half of the rubber extends, forming a hollow cylinder. A coating of rubber cement over the end of the pencil and the seam completes the job."—*Steven S. Erickson, Evans, Ill.*

A Baffling Case of Noise

The case-book of every serviceman carries at least one instance of noise that was responsive to steps on the floor. Usually, when the set has been eliminated (by running a twisted pair directly from the cut-out box to the radio, and opening the entire house-wiring circuit), this has been traced to BX rubbing against a gas pipe or water pipe. Ralph S. Harrison, of the Radio Service Laboratory, Barnesville, Ohio, reports a case in this category sufficiently baffling to justify description. Everything but ripping up the floor was resorted to without disclosing the source of the trouble. The noise was finally discovered to vary when a ceiling light was turning on or off at a wall switch. Inspection of the switch, however, showed nothing wrong, and the dome light itself appeared to be equally without blame. Leaving the radio turned on, the light was again tackled, and the noise ceased as the screws holding the fixture to the ceiling were loosened—and the problem was solved! The electrician who had installed the fixture had employed screws of excessive length. When the fixture was up tight against the ceiling, these screws were long enough to go through and just make contact (a perfect microphone!) with the BX.

Atwater-Kent No. 465 Q

"I have encountered several of these receivers with the identical trouble—the only fault I have to find with this excellent rural set. This is a 2-volt, battery-operated receiver. The trouble develops suddenly and is characterized by distortion or motor-boating—similar to that caused by low B or incorrect C voltages. Sometimes it blocks altogether. No ordinary test will show anything wrong with the set or tubes. If the finger is held to the grid caps of the tubes, a signal will come through. It will also operate when a B eliminator is substituted for the plate battery. A logical guess located the trouble in the tubular electrolytic by-pass condenser across the B-plus 135 volts to ground. Replacing with another 8 mfd. condenser repaired the set. The condenser removed was neither shorted nor open, but the capacity had dropped to only a fraction of its rating and leakage was high. The prevalence of this trouble with the model mentioned is due to mechanical injury caused by the clamp which holds the condenser to the chassis. The condenser is usually flattened out of shape."—O. Ingmar Oleson, *Ambrose Radio Service, Ambrose, N. Dakota.*

SERVICE SALES

F. C. Altpeter, of the Altpeter Radio Laboratory, sends us the card shown in
(Turn to page 749)

FIGURE 4

U. S. STA LIST	WTAM	1070	
WIND	840	WBUR	1090
WJZ	660	KMOX	1090
RFL	640	WJTD	1120
WRV	640	WABC	1170
WEAF	660	WKCY	1490
WMAG	470	ROCHESTER ST.	
WGLT	730	WLAC	1170
WGN	730	GSD	1175
WJR	750	WISN	1270
WISN	1270	GSA	603
WIBDA	1070	DJAN	930
WTAA	800	SJAH	680
WPAS	800	DRM	930
WVA	830	EAM	930
WLSR	870	EAM	930
WVLA	1070	WOPS	950
WCFL	970	ZBR	950
KDWB	1070	PARKS	1525
WHIO	1000	PARKS	1525
K3 W	1070	PARKS	1530

RADIO OWNERS

I have opened a first-class Laboratory for servicing all radio troubles for your convenience. Call us or bring your set in. We will gladly give you an estimate of what is to be done without obligation to you.

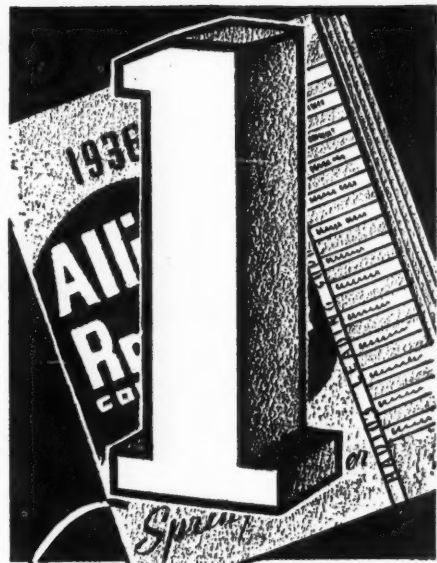
ALL WORK GUARANTEED

COME IN AND HEAR THE MASTERPIECE IV

ALTPETER RADIO LABORATORY

847 Chicago Avenue
Gte. 3444

F. C. ALTPETER, Radio Engineer



Great CATALOG with Everything in RADIO

4 great books in one—not merely an "Amateurs' Supply" pamphlet—nor a "Servicemen's Supplies" leaflet on a "Public Address" circular or a "Set-Builders' Selected" bulletin—adding Supply Guide—COMPLETE with EVERYTHING for EVERY ONE in radio—that's the new ALLIED Spring and Summer Catalog for 1936. A complete book, a man's-size, an honest book, with 136 value-loaded pages. 4 complete handy sections—a luxurious Public Address section, an elaborate "Ham" section, a newly revised Set-Builders' section, a handy Service Section—all combined to make your radio buying easier and more economical. For real convenience, for genuine value, for low price—shop your new ALLIED Catalog.

Read the elaborate Amateur section—a tremendous assortment of receivers and transmitters to meet every Ham requirement. Also dozens of build-your-own kits.

Standard Extraordinarily complete lines of standard, nationally known test equipment, thousands of parts, tools, accessories, books, etc.

P.A. men! Pages 19-36—a panorama of the finest assortment of sales-clinching, profit-making sound outfits and P.A. equipment that you ever laid eyes on. 4 to 50 watts; permanent and mobile—a sound system for every need.

Send your specifications to our Sound Engineering Division for valuable advice and low cost estimates, free of charge.

Radio—page after page of the newest, finest sets ever offered. Actual 1937 models, 4 to 11 tubes; short wave, dual wave, all wave, auto, 6 volt and battery sets. Astounding new "Teleyo" sets, de luxe phonoradio combinations in beautiful table and console models. And—special—the amazing new Farm Power units. **WRITE NOW FOR YOUR COPY.**

FREE
Spring & Summer
CATALOG

ALLIED ^{INC.} RADIO

ALLIED RADIO CORP. Dept. M
833 W. Jackson Blvd., Chicago, Ill.

☐ Send me your FREE Spring & Summer Catalog.

I am especially interested in.....

Name

Address.....

City.....State.....

RADIO OWNERS

I have opened a first-class Laboratory for servicing all radio troubles for your convenience. Call us or bring your set in. We will gladly give you an estimate of work to be done without obligation to

ALL WORK GUARANTEED

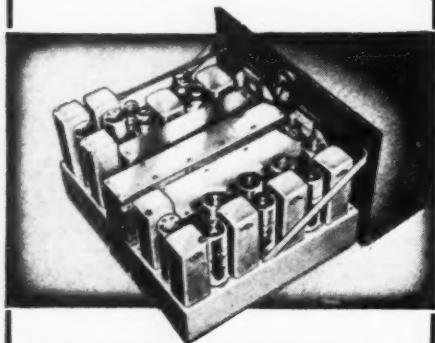
COME IN AND HEAR THE MASTERPIECE IV

ALTPETER RADIO LABORATORY

847 Chicago Avenue Gre. 3444

F. C. ALTPETER, Radio Engineer

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Servicemen's PRIZE CONTEST

Announcement of Awards

Zeh Bouck

Service Editor

FIRST PRIZE A Serviceman's Dream Come True

Figure 1, believe it or not, shows only a section of the Goodway radio shop, concerning which its proprietor, Earle C. Good, writes: "This set-up is the result of eleven years in the radio sales and service game, and was designed with the idea of practicability. The overhead lights are placed six inches in from the front edge of the bench. This position throws less shadow from the operator on his work, and at the same time is far enough forward to prevent glare. However, for night work, we find the goose-neck fixtures more restful on the eyes.

"Our test equipment is complete, and is portable. We have found that it is often more practical to take the apparatus—and occasionally a separate power supply—to the inoperative radio than to reverse the procedure. To each of our experts is allotted an assortment of tubes placed in recessed panels. These tubes are painted red, with the type number printed in white. The red tube in a receiver stands out like a sore thumb, to remind the serviceman that this is a shop tube and is not to be left in the customer's radio.

"The work bench is surfaced with Masonite. Two universal dynamic speakers are mounted in the wall (one of which can be seen at the right). These are fed from universal input transformers and cascaded field resistors, thus adapting the speakers to any input and field requirements. The drawers are used for additional tools, and also contain compartments for the orderly storage of spare parts, such as by-pass condensers, resistors, filter condensers, etc. At the end of each week these compartments are restocked, providing an additional check on the components employed in the past week's work. The spool cabinet, under the left end of the bench, contains radio hardware.

"Any radio repairman who has worked all day standing on a concrete floor—or any other hard floor, for that matter—

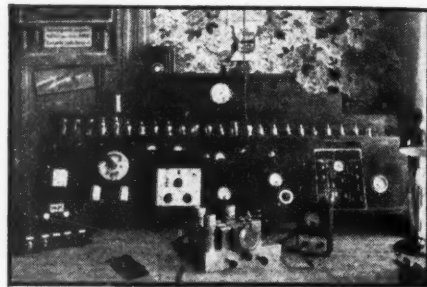


FIGURE 2

will appreciate the genuine comfort afforded by the slatted cat-walk shown in the photograph. This is made of 2½-inch by ¾-inch Idaho spruce—a very tough wood, but with sufficient spring in it to reduce greatly that all-in-from-the-waist-down feeling that so often accompanies an all-day session on a non-resilient floor."

SECOND PRIZE A Belgian Service Shop

The proprietor of the Radio Service Station (Figure 2), Anvers (Antwerp), Belgium, learned the radio service business in the United States and transplanted American methods to the other side of the briny. His experience in the U. S. A. has stood him in good stead with his European practice, as American radios are very numerous in Belgium, comprising approximately 30% of the sets used. The equipment consists of a.c. and d.c. meters in the power-line circuits, a combination volt-ampere-milliamperere-ohmmeter, tube checker, analyzer, two oscillators and an output meter. We like to feel that at least some measure of our second prize winner's success may be attributed to the fact that he has been a reader of RADIO NEWS for seven years!

THIRD PRIZE A "Case" for RCA-Victor

The letterhead of the Case Radio and

FIGURE 1



THIS MONTH'S WINNERS

FIRST PRIZE—To Earle C. Good, of the Goodway Radio, Public Address and Sound System, Ephrata, Pa.—\$10.00 for equipment, layout, and all the other details that contribute to efficient, modern servicing.

SECOND PRIZE—To The Radio Service Station, 37 Rue Schul (Harmonie), Anvers, Belgium—\$5.00 for compactness—showing what can be done in the way of complete equipment, in a minimum of space, without overcrowding.

THIRD PRIZE—To Rupert Case, of the Case Radio and Electric Service, Stockton, Kansas—\$4.00 for a highly creditable bench, topped with a familiar display that creates customer confidence.

FOURTH PRIZE—To H. E. Becker, Becker Radio Service, Grand Ledge, Michigan—\$3.00 for an effective balance between shop and portable equipment.

Congratulations and thanks from RADIO NEWS and its thousands of servicemen readers!

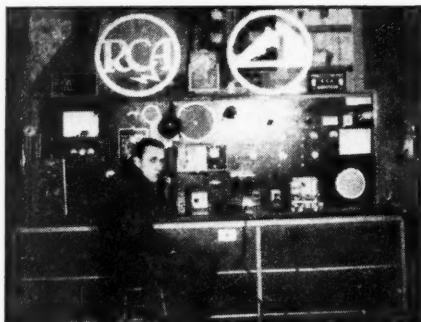


FIGURE 3

Electric Service states that they specialize in RCA and Zenith radios, and Figure 3 indicates the manner in which the former is boosted. Their stationery also indicates activity in "Electrical Wiring and Supplies." Mr. Rupert Case writes: "The bench (which measures ten feet long by four feet deep), as well as the main panel, are made of pressed wood. Tools, spare parts and tubes are neatly arranged in a show-case. The speakers are mounted behind galvanized hail screening. A main feature of the layout is the snap-on arrangement which permits the test equipment to be removed instantly for servicing in the field. An air compressor for cleaning sets, and various power supplies, are mounted under the bench. The condenser tester is of the neon lamp design and was constructed in the shop. Tubes are checked with a Supreme model 80 De Luxe counter tester.

(Turn to page 761)

FIGURE 4



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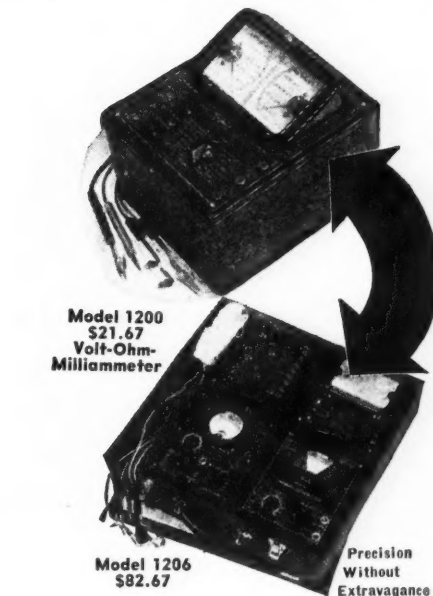
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RADIO PHYSICS COURSE

ALFRED A. GHIRARDI

Lesson 53. Resonance

FIGURE 1 shows a common tuning arrangement employed in radio receivers. We will assume that the passing radio waves from some station cut across an antenna, and induce a voltage in it of a frequency of say 500,000 cycles per second. This voltage sends an alternating current through the circuit which consists of the antenna, the primary P of the radio-frequency, is .00025 microfarads; and that the the capacitance C_A which exists between the antenna wires and the ground. A slightly higher e.m.f. (e) will be induced in the secondary winding "S" of the tuning coil by transformer action. Let us take a practical case and suppose that the e.m.f. (e) induced in S is one millivolt (.001 volt); that the secondary winding has an inductance of 300 microhenries; that the capacitance of the tuning condenser C, adjusted to produce resonance at this frequency, is .00025 microfarads; and that the total ohmic resistance of the secondary coil and condenser is 10 ohms.

The conditions are shown in (A) of Figure 1. The secondary coil and condenser circuit are usually connected across the input circuit of a vacuum tube as shown. It might be supposed on first thought that the secondary of the tuning

generator. If we connect two impedances across the terminals of the generator, these two impedances are in parallel but the two are in series with the e.m.f. In determining whether the connection is series or parallel, it is well to regard the source of the e.m.f. as a pump and the impedances, or rather admittances, as pipe lines. The pump forces a certain amount of water through the system. If the same amount of water is forced through two or more sections of the pipe system (two or more impedances) they are connected in series. If the sections of the pipe system are so connected with respect to the pump that the water can divide, the sections are in parallel. The electrical pump may consist of a primary battery, a storage battery, a magneto, a generator or dynamo, the secondary of a transformer, a microphone, a phonograph pick-up, a thermo-couple or the plate-filament circuit of a vacuum tube, etc.

At resonance, the current is in phase with the induced e.m.f. in the secondary winding, since the resistance is the only obstacle to the passage of the current under these conditions. An induced e.m.f. (e) of .001 volt in S will therefore send a rapidly

surging current of $I = \frac{E}{R}$ or $.001 \div 10 = .0001$ ampere through the circuit from one

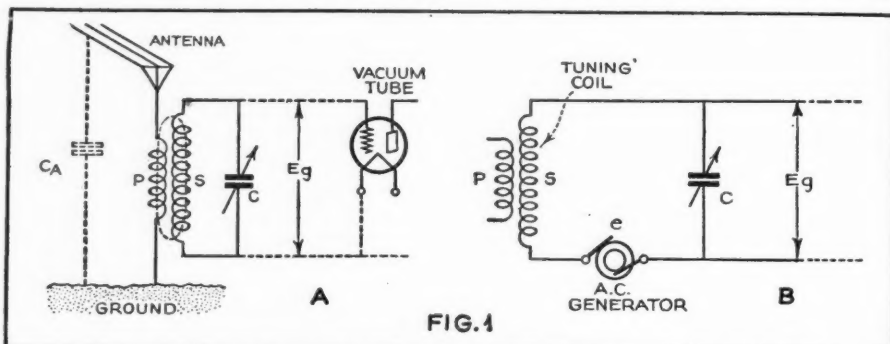


Figure 1. Series resonance in the tuned circuit of a radio receiver (acceptor circuit).

coil and the condenser form a parallel circuit, but this is not so. The voltage in the tuned circuit is induced in the windings of the secondary coil, and therefore is considered to be in series with the windings. The induced voltage (e) may be represented as being supplied by an a.c. generator developing an e.m.f. of .001 volt, in series with the secondary coil and tuning condenser as shown at (B).

The question of series and parallel connections is troublesome at times in tuned circuits. Whether the connections are series or parallel depends on the location of the e.m.f. with respect to the impedances. Suppose we connect a resistance across a battery. Is the resistance in series or in parallel with the battery? The e.m.f. in this case is in the battery, and anything that is connected across the terminals of the battery is in series with the e.m.f. This will be evident by actually drawing the circuit diagram in this condition.

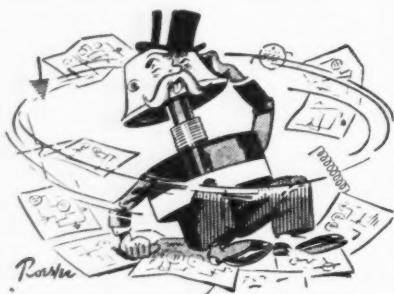
If we connect two impedances or resistances across the terminals of the battery, these two are in parallel, but the two of them are in series with the battery. If we substitute a generator for the battery, the same rule holds. The e.m.f. is in the generator, and anything that is connected across the output terminals of the generator is in series with the e.m.f. of the

condenser plate through the coil to the other plate and back again. From the table in Article 166, we find the capacitive reactance of a .00025 mfd. condenser at a frequency of 500,000 cycles to be 1,273.8 ohms. Therefore, since .0001 ampere is flowing into this condenser, the voltage E_C across its terminals is equal to:

$$E_C = IX_C = .0001 \times 1,273.8 = .13 \text{ volt}$$

Since the reactance of the secondary coil must also be equal to 1,273.8 ohms at resonance, the voltage actually existing across its terminals must also be equal to .13 volt.

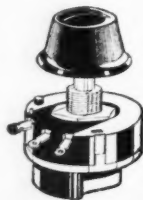
It is thus seen that, by means of resonance, the voltage E_C actually applied to the grid circuit of the vacuum tube is greatly increased over what it would be if the induced voltage (e) developed in the secondary coil by electromagnetic induction from the primary were applied directly to the grid circuit of the vacuum tube. In that case E_C would only be equal to .001 volt. Actually we find it is .13 volt, or 130 times as much. This example illustrates the great advantage gained by tuning the secondary winding of the radio-frequency transformer in a radio receiver, since the volume of sound depends upon the strength of the voltages applied to the grid circuits of the amplifier tubes. By tuning, it is possible to have a much higher voltage developed across either the con-



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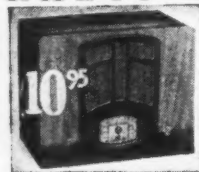
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denser or the inductance, than is impressed on the two in series by the e.m.f. induced from the primary winding by electromagnetic induction. The ratio of E_g to e is called the gain of the tuned circuit. Since E_g is equal to $2\pi fLI$ and E is equal to $I \times R$, the gain is equal to:

$$\frac{E_g}{e} = \frac{2\pi fLI}{IR} = \frac{2\pi fL}{R}$$

This expression for the "gain" indicates that, to obtain greatest efficiency from a tuned circuit, it is essential that the ratio of the inductive reactance to the resistance of the coil should be made as large as possible. Thus the tuning coils in radio receivers are designed to have as low resistance as practical, consistent with other controlling factors such as physical size, cost, etc.

The Service Bench

(Continued from page 745)

Figure 4, which he distributes among customers and prospects. The well-worded advertising portion can be torn off along the perforated line, and the convenient call list—containing both long and short-wave listings—is retained as an effective reminder of where efficient radio service can be obtained.

A Hot-Weather Sideline

Electric fans are a logical summer sideline to the radio service business, and the unique appearance and features of the Samson product (Samson United Corporation, Rochester, N. Y.) provides sales appeal that is not wholly dependent upon the thermometer. This fan, illustrated in Figure 5, has molded rubber blades (in walnut and pastel shades), which, while sufficiently rigid to deliver a steady, strong current of air, are flexible and cannot injure the fingers—thus eliminating the unsightly guard essential on conventional fans. The trade designation is the "Safe-Flex" fan.

Backstage

(Continued from page 743)

have a lot to do with the musical proceedings.

IF the picture of Broadcasting House accompanying this item looks dark, you can blame it on one of two things—or on both of them. The "things" are (1) the writer's ability as a photographer and (2) the winter fog of London. As a matter of fact, it was what looked like a real sunny day that prompted our standing at the entrance of All Souls' Church with a kodak aimed at the Portland Place radio palace which serves as the spearhead for all B.B.C. transmissions, including the "G" stations' short-wave features. Well, it's been some time since this picture was snapped, but, through constant listening to B.B.C. Empire transmissions, the structure has remained as vivid in our memory as if our visit to it was only yesterday. Due to the fact that all transmissions are in English, the B.B.C. short-wave offerings enjoy a tremendous following in the U. S. A. And the program directors are alert to add new ideas from time to time that demonstrate excellent showmanship. For example, there's the current "Who's in Town Tonight" series, heard Saturdays. Persons in various unusual walks of life are drawn to the microphone for interviews that are

fresh and crisp. Here's an idea for American broadcasters to follow.

DESPITE the fact that European short-wave programs seem to show an utter disregard for time schedules, there are certain phases of the foreign leisurely broadcasting method that American listeners think could well be followed by stations in this country. Because American programs start and end on split-second schedule, it is often necessary to condense musical scores, and this is a practice many music lovers deplore. If a program does not end conveniently on the scheduled moment abroad, the musicians just keep on playing past their time. But while music lovers approve this method, the idea cannot very well be copied in the U. S. A., where there are paying sponsors to account to for any infringement on "bought" time by a preceding musical program. The leading symphonies and other concert groups of London, Paris, Vienna and Rome have earned great popularity with American short-wave fans.

THE subject of international copyright of short-wave and broadcast-band programs shows promise of being one of the main topics to be considered at the International Copyright Convention in Brussels in September. Preparatory to the convention, the Board of Trade in England has a departmental committee considering questions regarding the rediffusion of copyright works and the fees that can be claimed by authors and composers. Suggestions have been made to clarify the terms of the copyright convention regarding broadcasting and the rediffusion of radio programs by any methods. The government of Belgium has proposed to add a paragraph providing that, subject to any stipulation to the contrary, any authorization to broadcast a work shall not include permission to record it.

Final Amplifier

(Continued from page 729)

greatly simplified. Unless a modulated doubler-amplifier is biased correctly it will give downward modulation. The adjustment of the bias is quite critical. With the higher grid driving power, this tendency was reduced.

It was found, too, that with the arrangement shown it is not necessary to go to the elaborate precautions we did at first to obtain a 5-meter inductance. As described last month, copper rods were used with a "shorting" bar. However, it was found that there was very little reduction in output when a bar fixed with plugs was connected directly across the two coil inductors. The 5 meter inductance thereby was provided by the leads to the condenser. It resonated at 5 meters with about $\frac{1}{2}$ of the capacity of the tank condenser.

It is important to point out here that if the transmitter is to be used on 28 and 56 megacycles, the leads to the tube and tank circuit must be kept as short as possible. If they are too long, they will make it impossible to hit resonance in the 5-meter band.

New Idea in Sound Systems

(Continued from page 731)

The cabinet is 5 feet 4 inches high, 2 feet wide and 16 inches deep, and its exterior has been designed along modernistic lines so as to present an attractive appearance in office or foyer.

Besides the built-in microphone facilities, additional microphones may be located in offices or nearby halls or hall rooms as required. Controls are arranged so that announcements may be made over any one or any group of loudspeakers or, in emergency, over all of them regardless of whether they are turned "on" or "off" at their respective locations.

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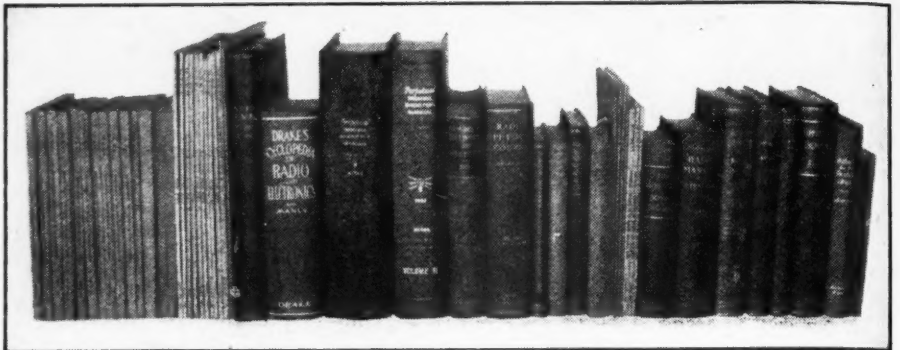
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THE TECHNICAL REVIEW

CONDUCTED BY ROBERT HERTZBERG

Radio Receiving and Television Tubes, by J. A. Moyer and J. F. Wostrel. Third edition, McGraw-Hill Book Co., 1936. The new edition of this textbook on tubes has been completely revised and brought up to date. The text covers a discussion of the principles of operation of all tubes, their applications as amplifiers, detectors, oscillators, etc., and gives the characteristics of all receiving tubes.

The book might be classed as "intermediate"; i.e., it is not as thorough as some of the engineering texts on tubes, yet covers the ground without going into higher mathematics. It will be found useful by everyone who expects to use tubes. The order wherein the material is arranged might call for some criticism, but it appears justified because it is more likely to keep the reader interested. After a brief introduction which explains some of the fundamentals of tubes, the authors discuss the construction of them. Materials and methods of construction of cathodes, grids, plates, and their sealing into the bulb are explained. Chapter III deals with the fundamental laws of electricity and radio circuits. Then follows a chapter on vacuum-tube action. Beginning with the phenomenon of emission, this leads up to the characteristics of each type of tube, including mercury-vapor rectifiers, gas triodes, glow lamps, pentodes, screen-grid tubes, magnetrons, etc. Obviously this is a very long chapter. Then follow chapters on radio meters and measurements, and on testing vacuum tubes. Chapter VII, entitled "Vacuum Tube Installations," gives customary circuits wherein tubes are employed. The next chapters go into each function more thoroughly and deal with the vacuum tube as detector, as rectifier, amplifier and oscillator. Television tubes are covered in another chapter; the various cathode-ray tubes, the iconoscope and the kinescope are described. Industrial applications of vacuum tubes are illustrated and explained. These include photocell control devices, relays, regulators, etc. A table of tube characteristics is included.

The authors have managed to be fairly well up to date. Data on the first crop of metal tubes is included, also the acorn tubes. Strangely enough, there is a circuit and discussion on the old "Triple Twin Tube," but nothing on its descendants, the 2B6 and 6B5.

Cathode-Ray Tubes and Allied Types. Technical Series TS-2, published by RCA Manufacturing Co. This booklet gives the characteristics and other useful data on cathode-ray tubes and the special rectifiers and gas triodes that are used with them. Besides a summing up of the characteristics and curves, there is considerable useful information on the construction of power supply and sweep circuit and the

application of the oscillograph. Readers who expect to use cathode-ray tubes will find this book a useful addition to their reference library.

La Radio? ... Mais c'est très simple!, by A. Aisberg, Société des Editions Radio, Paris, 1936. Curiousus had an uncle by the name of Radiol, a radio engineer. Curiousus learned from Radiol quite a lot about radio, so now in his 18th year he is an accomplished amateur and experimenter. Ignotus, 14 years old, is anxious to learn from Curiousus. The book consists of the conversation between the two lads with animated drawings. In these conversations Curiousus manages to explain all the complications of radio without using mathematics yet retaining accuracy. It covers all the newest tubes and circuits, including a.v.c., variable selectivity, etc. A reader needs to know the fundamentals of physics only. The numerous drawings in the margin illustrate the action by means of ingenious analogies. A decidedly worth-while book for readers of all ages who wish to understand radio and who can read French.

An Absolute Determination of the Ohm, by Harvey L. Curtis, Charles Moon and C. Matilda Sparks. Part of the Journal of Research of the National Bureau of Standards, Volume 16, January, 1936. This 82-page booklet should be of interest to physicists and advanced students of physics and electricity. The extremely complicated methods used in the measurement are described in detail, and all the mathematical derivations are given in full.

Units of Weight and Measure; Definitions and Tables of Equivalents. Miscellaneous Publication M121 of the National Bureau of Standards, Washington, D. C. A 68-page booklet of considerable reference value. Includes both customary United States and metric units, with numerous conversion tables that save the user a great deal of time. Incidentally, page 63 reveals the little-known fact that the metric system has been legal in the United States since 1866.

Standard Time Zones of the United States. Miscellaneous Publication M155 of the National Bureau of Standards, Washington, D. C. The standard time zone boundaries of the United States, with adjacent parts of Canada and Mexico, correct as of October, 1935, are shown in a large map which makes a useful and decorative wall display. The map is printed in light blue on a white background, with the time zone boundaries in red and each zone provided with a clock dial showing at a glance the difference in time between zones.

Review of Articles Appearing in the March, 1936, Issue of the Proceedings of the Institute of Radio Engineers

The Secondary Emission Multiplier, by V. K. Zworykin, G. A. Morton and L. Malter. Complete technical data on the most sensational tube development of recent months—multiplier phototubes having amplification factors of several million and designed to replace the conventional phototube and accompanying amplifier systems. The perfection of these tubes will undoubtedly bring about a profound change in vacuum-tube amplifier technique.

Review of Broadcast Reception in 1935, by R. H. Langley. A concise review of technical and merchandising achievements of the year past.

Radio Developments During 1935, by C. M. Jansky. Deals with the broadcast side of the industry.

A Review of Radio Communication in the Fixed Services for the Year 1935, by C. H. Taylor. A Review of Radio Communication in the Mobile Services, by Clifford N. Anderson; Progress in Allied Fields to Radio, by O. H. Caldwell. Further review articles whose titles are self-explanatory.

An Experimental Television Receiver Using a Cathode-Ray Tube, by Manfred von Ardenne. Description of a laboratory type receiver which has proved very successful in reproducing images broadcast from Berlin. Photographs of television pictures as received by the equipment indicate that high-quality results are obtained.

Losses in Twisted-Pair Transmission Lines at Radio Frequencies, by C. C. Harris. This interesting paper reveals that losses in the popular types of twisted-pair lines are extremely high, and that open-wire or air-spaced types of lines are much superior at frequencies above one or two megacycles.

Present Practice in the Synchronous Operation of Broadcast Stations as Exemplified by WBBM and KFAB, by L. McC. Young. This paper briefly covers the history of synchronization of broadcast stations in the United States and abroad.

Grid Temperature as a Limiting Factor in Vacuum-Tube Operation, by I. E. Moutseff and H. N. Koazanowski. Description of a method of determining the grid dissipation at which primary or thermionic emission from the grid takes place.

Terrestrial Magnetism and Its Relation to World-Wide Short-Wave Communications, by Henry E. Hallborg. The functioning of short-wave circuits is found to be closely related to the geographical distribution of terrestrial magnetic activity. Europe is shown to be more favorably located geographically and diurnally than the United States with respect to interference of this kind.

Low-Frequency Transmission Over Transatlantic Paths, by H. H. Beverage and G. W. Kendrick. Continuous records of field intensity taken at several receiving points and on various types of antenna systems are compared, and evidence of incoherent low-frequency fading is found.

A Study of Ground-Wave Radio Transmission, by R. C. Higgy and E. D. Shipley. The excellent agreement between the value of ground-wave field intensities (observed in Ohio) and the Sommerfeld theory is described. The application of this theory in predicting signal intensities is also indicated.

An Analysis of Distortion in Class B Audio Amplifiers, by True McLean. The

more important defects of Class B audio-frequency amplifiers are classified and examined in detail. A general method of determining harmonic components introduced by curvature and asymmetry of the combined plate-current curves of a pair of tubes is given, with a tabulation of results in a practical case.

Notes on Piezo-Electric Quartz Crystals, by Isaac Koga. The chief characteristics of quartz plates cut at various angles to the crystal axes are described, with special attention to the effect of temperature on frequency of oscillation. Particularly stable oscillators using two crystals in a single circuit are also described.

Review of Contemporary Literature

Scophony Television, Electronics, March, 1936. Details of a high-definition system developed in England and using a "split focus" optical arrangement and a double image Kerr cell.

Plastics, by Herbert Chase, Electronics, March, 1936. This interesting and well-illustrated article describes the mechanical and electrical properties of phenolic, urea, cellulose acetate and styrol materials commonly used in electronic apparatus.

Ballast Tubes, Radio Engineering, March, 1936. A suggested solution of the pilot-light problem in a.c.-d.c. receivers.

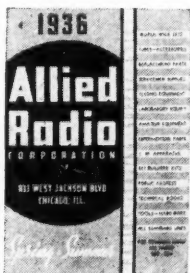
Variable Selectivity and the I. F. Amplifier, by W. T. Cocking, The Wireless Engineer (London), March, 1936. A highly mathematical paper dealing with the design of i.f. transformers for variable selectivity.

Microphone Characteristics for P. A. Service, by C. J. Brown, Service, March, 1936. A good review of the available types of microphones, written from the practical standpoint.

Free Bulletins

Information on Sound Equipment

The latest Webster catalog outlines their 1936 line of public-address amplifiers, speakers and phonograph equipment. This book is a handy reference catalog for sound engineers and servicemen. Free copies are available by addressing requests to Radio News, 461 Eighth Avenue, New York City.



Catalog of Radio Supplies

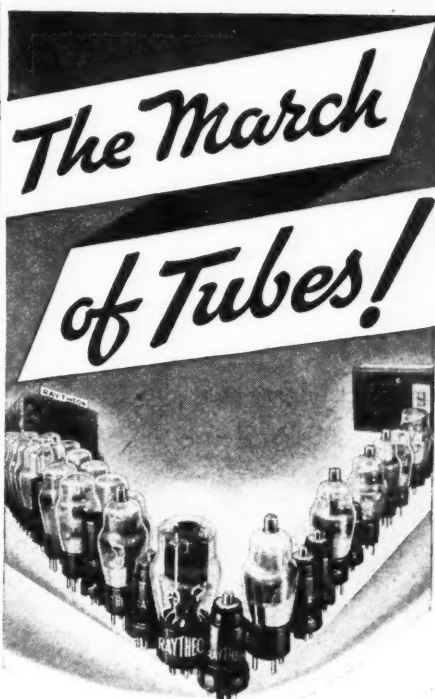
Allied Radio Corporation has just released its new 136-page spring and summer catalog, listing radio receivers, sound systems, test instruments, amateur supplies, kits, etc. Copies can be ordered free of charge from Radio News, 461 Eighth Avenue, New York City.

Transmitter Bulletins

The Collins Radio Company's Model 45A and 30FNC short-wave transmitters, of 40 and 175 watts telephone rating, respectively, are described in two beautiful bulletins which show all details of construction. Copies of these folders are available free of charge to amateur and broadcast station engineers through Radio News, 461 Eighth Avenue, New York City.



New Radio Catalog
A new spring catalog of radio receivers, P. A.
(Turn to page 755)



Millions of Raytheons in the Homes of America . .

AS TIME MARCHES ON—so Raytheon tubes literally by millions, pour from the factory to set manufacturers and into thousands of homes as initial tube equipment in new sets. The "March" paves the way for almost unlimited replacement sales.

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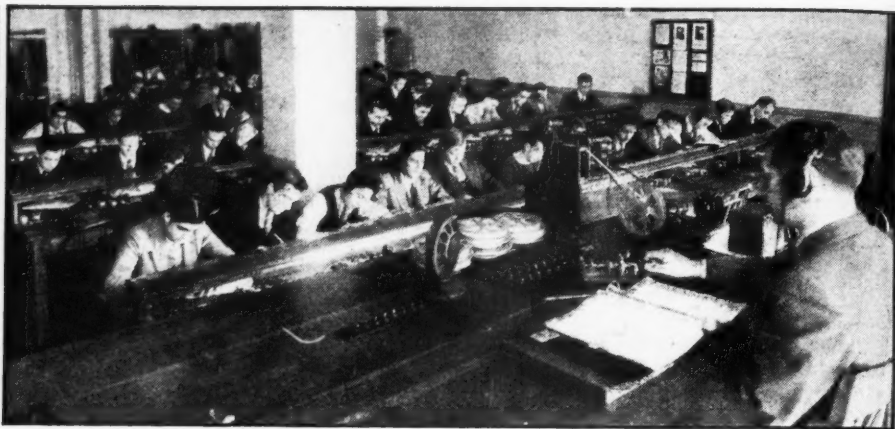
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QRD? QRD? QRD?

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A GAIN the amateur operators come to the front-page news with their heroic efforts put forth bringing news to the outside world during the terrific flood which inundated such a large part of the East Coast and vicinity. The short, staccato messages which came through told only of the hardships and needs of the flood victims, but nothing was said of the 48-hour straight watches stood by men and boys to bring aid. Nothing was said of dying power, of fear for their own lives and of tired lips relaying messages or of sleepless fingers pushing a key until they seemed to operate by some subconscious, automatic effort.

A FEW of the outstanding hams who did yeoman work were George H. Walter, W2HYP, in New York and Gerald D. Coleman, Naval Reserve, in Johnstown. Since the beginning, when a few wireless operators got together and formed the ARRL back in 1912, these men have aided greatly in the forwarding of mercy msgs, giving vital news toward the succoring of human lives and pioneering on wavelengths which commercial interests did not think so hot, and took the congestion out of the air. There were only a few thousand ops in the organization at the time we entered the War and for its brief (?) duration all amateur stations were shut down by the government. After hostilities ended there was a terrific boom in amateur operating, until the organization has today a membership of over 40,000.

Strange stories can be told of some of the experiences of the amateur operator. They became relay stations for the friends and relatives of those who were on the Byrd Expedition and the interception work they carried through to successful ends will make good reading. Another thrilling incident is related by Frank Lester, W2AMJ, who succeeded in contacting some Brazilian hams during the time of the Dyott Expedition looking for the River of Doubt. Constantly msgs were exchanged by Lester, some of which were relayed to the New York *Times* newspaper. Then for a period of two weeks nothing was heard from South America. Not a bit of information came through from the exploring party and fears were being felt for their lives. Then one night, after Lester had been on watch for many, many hours, he decided to go out with a friend for a breath of air. Upon his return he was called by another ham in Long Island who told him that Brazil had been calling him for the past couple of hours while he was away from his key. Well, it wasn't long before he contacted them and through the ether came a 190-word message telling of the capturing and rescuing of the expedition! This msg was relayed to the *Times* which could only have gotten the news through the amateur medium. Others more romantic can be told, but for lack

of space it is impossible to chronicle them all. Suffice to say, L'il Willie Ham is strutting his stuff.

The Heading this month shows classes receiving code instruction at the R.C.A. Institutes, New York City.

Bernie J. Fold, an amateur of long standing, has just recently completed a standard transmitter which, for its simplicity and effectiveness, is about the finest job ye Ed has ever seen in any one's apartment. As he remarked, "It's a case of whether your parents are to live with your radio or whether the radio is to dominate the whole house." He got his first class ticket as a commercial operator many years ago and has stepped right along from the Century Buzzer, the spark coil and a 1-kw. synchronous job up to the tube x'mtr. He has remained in the field watching each new development although he has been kept busy practicing law. He sez that his years as an amateur have been one of unalloyed pleasure and as a former member of the Brooklyn Radio Club he has done everything in his power to further the cause of the ham op. One of the finest things he thinks radio has done for a person is the case of a chap, Dick Noble, W2DBQ, who had nothing to do but sit all day in a wheel chair. One day he wrote to one of the ham mags and was referred to the B.R.C., which took him under their wings and made him a full fledged amateur. Members were even delegated to carry him down to their meetings and a new life opened for him, which to this day is the brightest spot on the escutcheon of that club. Bernie Fold, in his capacity of Lt. JG. USNR, suggested that if any hams wish to become members of the United States Naval Reserve, to please write to him at 145 West 71st Street, New York City, and he will send them the necessary data. He states that there is a trip every year called a cruise for fifteen days with pay, free training courses, and many other features which should appeal to the average ham. So give him a howl, me lads.

If any op wishes to write a book, get away from his frau or beat the collectors, his opportunity is just around the corner, that is, if the Department of Commerce can get the necessary funds. The idea is to

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dot the Pacific Ocean with gigantic rafts to guide the airliners to and from the Philippines and the States. These rafts would house three or four men with a radio station built on it, a rescue boat and weather recording instruments. The bill has already been introduced, so hold your breath and keep your fingers crossed.

One of our enthusiastic fans dropped into the office of ye Ed t'other day and gave vent to his feelings by taking us to task because of the amount of space which has been given to the ARTA organization since its inception. 'Tis true, me lads, 'tis true, but it has been the policy of this colyum to print the truth and nothing but, and we have believed that the ARTA has always been the organization for the radio operator and technician, because it stood for the only strong union means to pull the ops together into a united whole for the benefit of morale, efficiency and greater wage earnings. Years ago we investigated and found that the men behind it were white men and against great handicaps were honestly trying to form an organization for the benefit of the operators. There were paragraphs on end printed when we did not believe some of their policies were sound, and then again, we did boost other ideas. Only a short time ago we devoted quite a bit of space knocking the living daylight out of the organization when they held a convention behind closed doors. We wanted the unadulterated information and news and not that which is handed to the press for publication—and we are getting it! We recently received from the head office of the ARTA an apology, and the inside dope is also being handed out. But we cannot delve into the minds of the men who make up the rank and file to find out if they have any grievances, fancied or otherwise. If there are actions going on which are undercover, it is only fair to the man and to other operators to write in to this column and "spill the beans" which you all can rest assured will be sifted down to the very bottom and the truth found. This column is for you and by you, so it is up to you to give it all the cooperation to make it a truthful and clean news-getter, for the benefit of all. We do our best, but it is a true saying "Every one knows who killed the man but the police."

But now that we have boosted the Ham Op, may we not also be frank and do a tiny bit of knocking. Due to the fact that there is little real organization of the amateur and due to the childishness of a few, it seems that during any national catastrophe when the air should be controlled by a few key stations as in commercial operating during an SOS, Some L'il Boy Blue decides to jam up the ether. Of course, it is only the last-few-years type who cause such a muddle, so if these chaps will permit the older and wiser old timers to take them in hand, we know that they will get somewhere for their own good. So with a ge....73....GY.

DX Hints

(Continued from page 710)

22 gauge or the like, is wound on a 2- or 3-foot length of copper pipe, of which the diameter may be anywhere between or near 1 and 2 inches. Bury the assembly well down in moist earth. One fault with the usual cold-water pipe ground is that there may be an insulating gasket in a pipe connection between your ground wire and earth. Almost any metallic mass buried in moist ground will make a good "ground". An old clothes boiler, automobile radiator, hot water tank—all are good.

All joints in aerial and ground leads must be carefully made and soldered to insure both a strong mechanical and electrical contact. The

(Turn to page 762)

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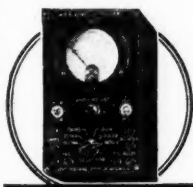
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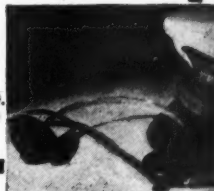
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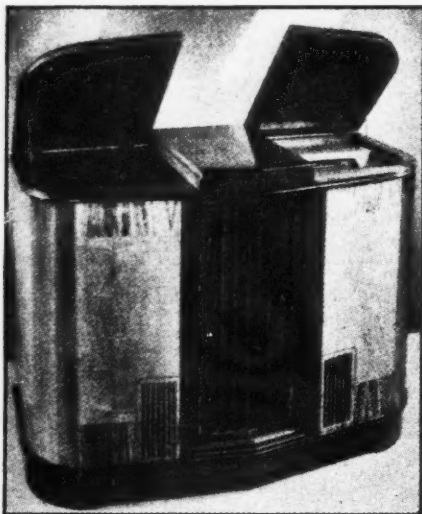
WHAT'S NEW IN RADIO

WILLIAM C. DORF

(Continued from page 711)

24-Tube Radio-Phono Combination

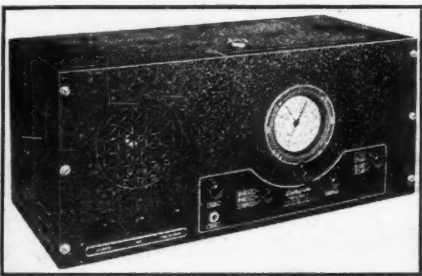
This attractive console cabinet houses the new Midwest Royale 24-tube, all-wave receiver and latest type automatic record-changing phonograph. It can play eight records successively without attention. The receiver is made up of two units, the tuning chassis employing 13 tubes and the



power amplifier unit, which utilizes 11 tubes. Some of the important features include: high-fidelity reproduction with triple speakers (one bass and two tweeters), 40 watts power output and an extremely wide tuning range of $4\frac{1}{2}$ to 2400 meters in six bands.

Amateur Receiver Available in Kit Form

The Wholesale Lafayette "Professional" 9-tube superheterodyne uses an r.f. pre-selector stage on all bands. It includes automatic as well as manual volume control, has a beat-frequency oscillator for code reception and is equipped with mechanical bandspreading. The set can be obtained in either kit or completely as-

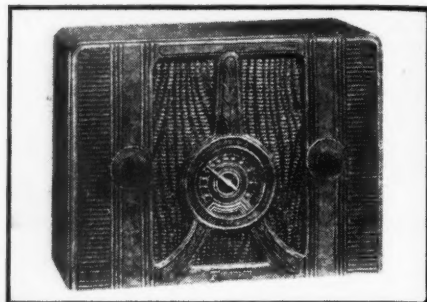


sembled form and the feature of the kit is its pre-assembled tuning unit. The tube combination is as follows: a type 6D6 as r.f. amplifier, a 6C6 as mixer a 41 as an oscillator, 6D6 for the first i.f. amplifier, and a 6B7 second i.f. amplifier, diode detector and a.v.c. tube, a 6C6 audio-amplifier, 42 power output tube, a 76 b.f. oscillator, and an 80 type rectifier. Wavelength coverage 9.7 to 560 meters.

Personal Receiver

The Emerson model 118 a.c.-d.c. set uses 5 tubes, has a tuning range from 180 to 550 meters and is equipped with a built-in antenna and an electro-dynamic speaker.

The tube equipment comprises: one 6D6,



one 6C6, one 43, one 25Z5, one 2VR and a 215 metal ballast tube.

Receiver with 8-Inch Tuning Dial

At first glance the most apparent refinement offered by this new Allied Knight 7-tube receiver is the 8-inch dial with "Index Reference" tuning, a method of reference points, clearly marked bands and zone locations to simplify tuning. Metal tubes are employed throughout. It is a three-



band receiver, tuning range of 17 to 565 meters, has triple-tuned i.f. transformers and many other features.

Employs 8 Metal Tubes

This attractive Federated "Acratone" 8 tube superheterodyne has a number of features to recommend it to short-wave and broadcast listeners. It offers a continuous wavelength range from 17 to 565 meters, 5 watts power output using two 6F6's in a



push-pull output stage, a 28 to 1 ratio tuning control, and an 8-inch dial with an illuminated scale calibrated in both kilocycles and megacycles.

Latest Instrument for the Serviceman

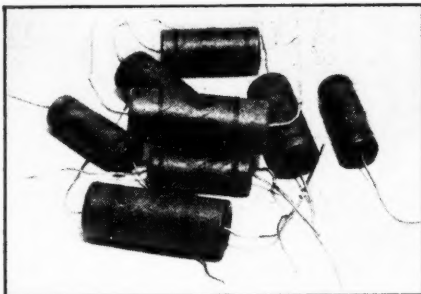
An announcement was recently received from the Jackson Electrical Instrument Company of their new universal d.c. "Multi-Meter" which servicemen should find extremely useful, for point to point



testing. Also especially applicable as a general purpose meter for amateurs, experimenters and sound engineers. Its specifications follow: d.c. volts—0 to 5, 50, 500 and 1000; 1000 ohms per volt and resistance ranges— $\frac{1}{2}$ to 500 and 200 to 500,000 ohms.

Tubular Condensers

The Tri-Jay Products Co. introduces a line of tubular by-pass condensers mounted in cardboard tube containers. They are



compact, highly impregnated and wax sealed (not paraffin) and are available in sizes from .0001 to 1.0 mfd. and in standard voltage ratings for amplifier and receiver requirements.

Uses Rear Bumper For Auto Radio Antenna

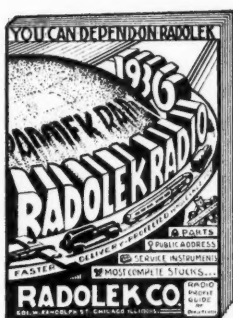
With the F & H Radio Laboratories' special bumper insulators and bolts it is now possible to use the rear bumper of your car as a motor-car radio antenna. The installation only requires a few minutes and is accomplished by removing the rear bumper bolts and inserting in their place the insulating bolts and the spacer insulators provided, to completely insulate the bumper from the body of the car. The equipment comes complete with a shielded lead-in which can be run along the frame channel of the motor car up to the radio set. Although the bolts and insulators

(Turn to page 768)

The Technical Review

(Continued from page 751)

equipment, replacement parts, and electrical appliances has been issued by Wholesale Radio Service Co. Copies are obtainable free of charge from RADIO NEWS, 461 Eighth Avenue, New York City.



Latest Catalog

The newest edition of the Radolek catalog contains 160 pages devoted to a large assortment of radio supplies, and besides includes much helpful technical information. Copies may be had free of charge from RADIO NEWS, 461 Eighth Avenue, New York City.

RADIO NEWS Booklet Offers Repeated

For the benefit of our new readers, we are repeating below a list of valuable technical booklets and manufacturers' catalog offers, which were described in details in the January, February, March, April and May, 1936, issues. The majority of these booklets are still available to our readers free of cost. Simply ask for them by their code designations and send your requests to RADIO NEWS, 461 Eighth Avenue, New York, N. Y. The list follows:

Ja2—Radio Parts Catalog, of Insuline Corporation of America. Free.

Ja3—Book Circulars of Alfred A. Ghirardi. Free.

Ja4—Latest Wholesale Radio Service Co. Catalog—listing receivers, sound equipment, amateur and service replacement parts, etc. Free.

F1—Catalog of Radio Parts. The National Co., Inc. Free.

Mh1—Sound Equipment catalog. Inter-World Trading Corp. Free.

Mh2—Radio Parts catalog of Bud Radio, Inc. Free.

Mh3—Amateur Equipment catalog of Wholesale Radio Service Co., Inc. Free.

Mh4—Tube Tester Booklet of Supreme Instruments Corp. Free.

A1—Condenser Replacement Manual of P. R. Mallory Co., Inc. Free to servicemen.

A2—"Your Future in Radio", 32-page book of Sprayberry Academy of Radio. Free to readers seriously considering a modern education in radio.

A3—Radio Capacitor Catalog of Solar Mfg. Co. Free.

My1—Information on a new antenna system. Technical Appliance Corp. Free.

My2—Condenser bulletin of Cornell-Dubilier Corp. Free.

My3—Free. Instructive bulletins on measuring resistance and proper use of resistors to extend meter ranges. Aerovox Corp.

My4—Free. Folders on Polyrion core coils. Aladdin Radio Industries, Inc.

My5—1936 condenser catalog. Sprague Specialties Co. Free.

Just Out! 1936 "Radio Handbook"

THE 1936 edition of the "Radio Handbook," published by the Pacific Radio Publishing Company, surpasses the '35 edition in the number of pages (total 360 pages) with more informative data, charts, and tables, and constructional details accompanied by circuit diagrams of low- and high-powered transmitting circuits and also complete data on short-wave receivers from a one-tube set to a deluxe crystal-filter superheterodyne. Latest information is given on antenna systems. The fundamentals of radio are explained and there is a chapter on learning the code, with rules governing amateur radio stations and operators. It is an unusually fine reference book and should have a place in every amateur or experimenter's radio library. The price of the book is one dollar (\$1.00) and any reader desiring a copy can obtain same by forwarding his remittance to RADIO NEWS, 461 Eighth Avenue, New York City.

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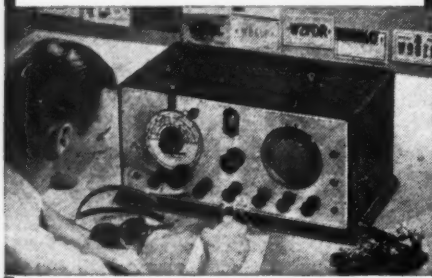
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Official Observer Harry E. Kentzel,
Averill Park, New York, who certainly steps out on short-waves

The DX Corner (Short Waves)

(Continued from page 722)

ton, Sahlbach, Self, Howald, Gaiser.) Observer Houghton says that their times on the air are Tuesdays and Wednesdays, 6-10 a.m., Mondays and Thursdays 3-7 a.m., Saturdays 6-11 a.m. and daily, 11:30 p.m.-1:15 a.m., E.S.T.

YBZ, Menado, Celibes, N. E. I., 7860 kc., reported heard. (Law.)

YDO5, Sourabaya, Java, N. E. I., 2,930 megacycles, reported heard at 8:30 p.m., E.S.T. (Sahlbach.)

PNI, Makassar, N. E. I., 8770 kc., reported heard 3:40 a.m., E.S.T. (Chambers.) Reported heard 10 a.m. (Moore.)

AFRICA

ETB, Addis Ababa, 11,955 megacycles, reported heard Sundays 4:30-4:50 p.m., E.S.T., with news reports, music, etc. This station announces that listeners should send in reports of reception to RADIO NEWS. (Hull; Frost, Meehan, Leroi, Rogan, Pettis.)

IDV, Asmara, Eritrea, 22.40 meters, reported transmitting war news. (Lawton.)

VQ7LO, Nairobi, Kenya, Africa, 49.31 meters, reported heard regularly. (Godee.)

SUV, Cairo, Egypt, 10,055 kc., reported heard late afternoons. (Gavin.)

SUZ, Cairo, Egypt, 21.7 meters, reported heard 11:30 a.m.-1 p.m., E.S.T. (DeLaet.)

EA8AB, Santa Cruz de Tenerife, Canary Islands, 7210 kc., 41.6 meters, reported heard daily 8:15-9:15 a.m. (Gaiser.)

NORTH AMERICA

W1XAL, Boston, Mass., 11,790 kc., reported heard, educational programs, news, music, 4 p.m., E.S.T. (Joerger.)

VE9DR, Montreal, Canada, reported heard on 6005 kc. from 8 a.m.-12:30 or 1 p.m. relaying CFCF. (Belanger.)

W9XAA, Chicago, Ill., 11,830 kc., reported heard 9:15-10 a.m. and 10-11 p.m., E.S.T. (Amos.) Other listeners report transmissions start at 8 a.m. and run throughout the day. (Stark, Howald, Adams, Reilly, Bower, Pilgrim, Holt.)

W2XE, New York, N. Y., 15,270 kc., reported heard as late as 12 noon in India. (Wadia.)

W2XAD, Schenectady, N. Y., 15,330 kc., reported heard in Africa with a fine signal. (Mallet-Veale.)

The following high-frequency transmissions have been reported by observers:

W8XAI, Rochester, N. Y., 31.6 megs., 9.48 meters, is heard rebroadcasting WHAM 11 a.m.-5 p.m. (Amos, Bower, Parcels.)

W8XWJ, Detroit, Mich., 21.6 megs., 9.48 meters, reported heard 6:15 a.m.-12 noon, 2-5 p.m. and on Sundays 2:30-7:30 p.m., E.S.T. (Wickham, Parcels.)

W9XG, Chicago, Ill., 28 megs., reported heard 8:30-9 p.m., broadcasting television pictures. (Davis.)

W2XDV, New York, N. Y., 31.6 megs., reported heard Saturdays 4-5 p.m., E.S.T. (Amos.)

W1XER, Boston, Mass., 31 megs., 500 watts, reported heard. (Neal, Cummings.)

W9XPD, St. Louis, Mo., 31.6 megs., reported heard 1-4 p.m., E.S.T. (Howald.)

W6XKG, Los Angeles, Cal., 35.6 megs., reported heard daily all day long. (Howald.)

W9XBY, 1530 kc., has a DX tips program Friday evenings 6:30-7:30, E.S.T. (Ludewig.)

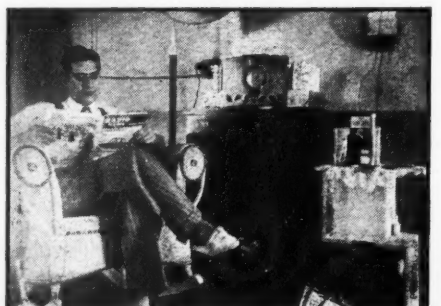
XERA, Mexico City, Mexico, 6180 kc., 49 meters, reported heard 7:45-8 a.m. and 8 p.m.-12 midnight. (Hynek, Sahlbach, Gavin.) Observer Bower says the frequency is 6170 kc.

XECR, Mexico City, Mexico, 7380 kc., 20 kw., reported heard Sundays 6-7 p.m. (Hynek, Miller, Howald, Coover.)

XEMO, Tijuana, Mexico, reported

COOL IN EL SALVADOR

Introducing Jose Rodriguez Rivas of Cojutepeque, El Salvador who is not only an Official Observer for RADIO NEWS but the representative of the I.D.A. for that territory





EFFICIENT WESTERN POST

Bruce Holmgren of Highland Park, Illinois swears by (not at) RADIO NEWS and his G.E. model K-80 receiver to get the best results for short-wave listening

heard on about 6015 kc. irregularly, 7-12 p.m., E.S.T. (Moore.)

XEUW, Vera Cruz, Mexico, 6020 kc., reported heard 6-11 p.m. (Holt.)

XEME, Mexico City, Mexico, 9520 kc., reported heard 7-8:30 p.m., E.S.T. (Gavin, Betances.)

XEBT, Mexico City, Mexico, reported heard on 6000 kc. with 1 kw. (Gavin, Nelson.)

COCH, Havana, Cuba, 9425 kc., reported heard 8:30 p.m.-12 midnight. (Amos, Coover, Law, Fritsch, Immicke.)

COKG, Santiago, Cuba, reported heard 9-10 a.m., 10:30-11:30 a.m., 1:30-3 p.m., 4:30-10:11 p.m., 12 midnight-2 a.m., E.S.T. (Hynek, Millen.) Self says the frequency is 6145 kc.

CO9JQ, Camaguey, Cuba, 9665 kc., reported heard daily except Saturdays and Sundays, 5:30-9 p.m., E.S.T., irregularly to 10 p.m. (Mormon, Amos, Rodriguez, Behr, Scala, Davis, Hynek.)

CO9WR, Sancti, Spiritus, Cuba, 6235 kc., reported heard 8:30-10:05 p.m., E.S.T. (Rodriguez, Lamb, Millen, Danforth.)

HH2S, Port-au-Prince, Haiti, 5915 kc., 100 watts, 49 meters, reported

CROSSED CAPTIONS SCRAMBLED IDENTITIES

This is really the picture of Boris Scheierman of Stockholm, Sweden, Official Observer for that country for our magazine. This photograph was run earlier with a caption that stated it was Dwight Williamson of Dayton, Ohio. Apologies to all concerned



heard daily except Sunday, 7-10 p.m. They are also reported daily except Sundays 1-2 p.m., E.S.T. (Kentzel, Bastien, Bower, Winand, Seright, Gavin.)

HI3U, Santiago, D. R., 6383 kc., re-kc., reported heard 6:30-8:15 p.m. (Rodriguez, Seright, Coover, Fritsch, Kemp.) Seright reports them on 9612 kc., daily except Sundays, 7-8 p.m., and Sundays 12-1 p.m., E.S.T. Observers Richardson and Gavin say frequency is 9595 kc.

HI3U, Santiago, D. R., 6385 kc., reported heard daily except Sunday 5:30-8 p.m. (Winand.)

HI1J, San Pedro de Macoris, D. R., 5865 kc., reported heard 12-2 p.m., 6:30-9 p.m., E.S.T. (Wilkinson.)

HIL, Trujillo, D. R., 6510 kc., reported heard 6-9 p.m., E.S.T. (Kentzel.)

HI4V, Trujillo, D. R., 6450 kc., reported heard 9:45 p.m., E.S.T. (Rodriguez.)

HI9B, Trujillo, D. R., 6050 kc., reported heard irregularly 5-11 p.m., E.S.T. (Hynek, Millen, Shea, Betances, Anca.)

HIW, Trujillo, D. R., 11,040 kc., reported heard irregularly 5:50-9 p.m. (Lamb.)

HIT, Trujillo, D. R., 6630 kc., 45.25 meters, reported heard daily except Sundays 12:30-2 p.m., 6-9 p.m., and on Saturdays from 11 p.m.-1 a.m. with a DX program. (Bower, Trzuskowski, Lamb, Dressler, Atkinson, Akins, Grabek, Jensen, Scala, Kentzel, Gallagher, Meehan, Millen, Messer, Danforth, Miller, Seright.)

HRD, La Ceiba, Honduras, 6235 kc., reported heard daily except Sundays 8-10:45 p.m. (Butcher, Danforth, Betances, Anca, Mormon.) Observers Winand, Miller, Dressler say the call is HRV. Observer Shea reports the call as HRB.

HRN, Tegucigalpa, Honduras—5910 kc. is now the correct frequency, having moved from 5875 kc.—reported heard 9:30 p.m., E.S.T. (Williamson, Dittmann, Holt, Lowe.)

YNVA, Managua, Nicaragua, 8590 kc., reported heard 8-10 p.m. daily. (Winand, Shea, Butcher.)

TG2X, Guatemala City, Guatemala, 5940 kc., reported heard except Saturdays 8-10 p.m., E.S.T., and on Saturdays 8-11:15 p.m. (Amos.)

TIPG, San Jose de Costa Rica, 6410 kc., 6-10 p.m., E.S.T. (Amos.)

HP5B, Panama City, Panama, 6030 kc., 49.75 meters, reported heard 7-

(Turn to page 760)

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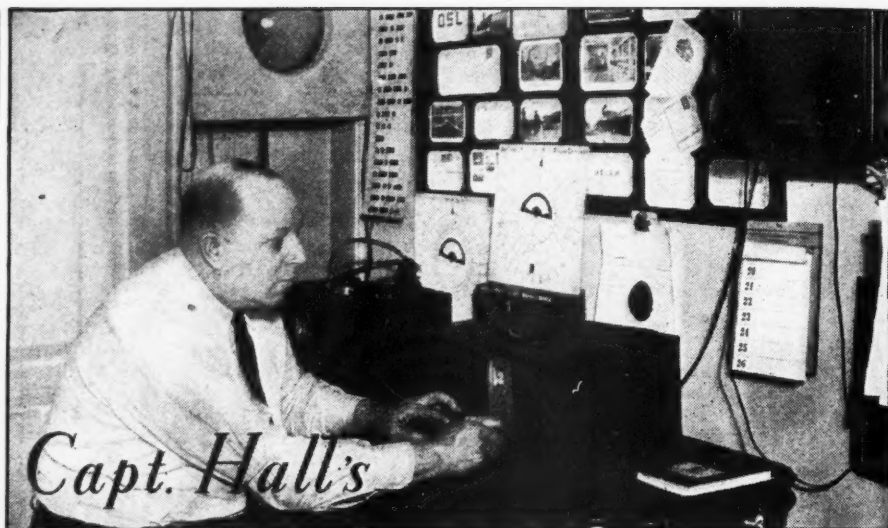
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Capt. Hall's

SHORT-WAVE PAGE

SEVERAL months ago the short-wave listeners drifted up to the 14-megacycle amateur band and discovered a new field! Listeners interested in hearing the usual cross-talk of the amateurs were delighted and then others had their attention attracted by DX possibilities. Then came the flood!

IT was and continues to be a known fact that signals radiated from every corner of the world may be tuned in on the amateur 20-meter band. Comparatively low-powered transmitters have been heard round the world. With due consideration to the time of day that the tuning was "going on" it was a simple matter to tune in amateur stations from Asia, Africa, Australia and Europe. South American countries never before heard on any short-wave broadcasting band were picked up.

Just at this time when all of us realized how interesting these amateur operators were, a disaster rushed upon our country. The American amateurs, sixty-some-odd thousand strong, now had a wonderful opportunity to prove their worth! For the entire period of the Johnstown flood calamity, we were at our receivers, listening attentively to their activities. We may say now that our opinion of the amateur is entirely unbiased and we can readily see how many obstacles are cast in their path.

During the long and weary night hours amateurs did some excellent work, but far more could have been accomplished if this powerful army was organized! All wanted to help! Few knew just what to do! And some, not knowing what to do, caused considerable interference to the experienced operators who were doing such wonderful work in communicating with the stricken areas.

Hundreds of instances rush through our mind, but space does not permit us to cite them all. Here are just a few examples. During this trying period the only known outlets from the stricken city of Johnstown were amateur stations W8FRC and W8KRF. The former station, operated by Gerald Coleman, brought the word to a listening world that the waters were taking their toll of life and property. The latter station, operated by Milton Hanson and ably assisted by W8EHR, Theodore Campbell, was in operation for hours and days at a time. W8KRF, had only one crystal; that was 1960 kc. All ingoing and outgoing messages had to be delivered and received through this channel! Any amateur who listened on this band knew, and if he did not, he *should* have known, that if the entire band was a seething mass of heterodynes, 1960 kc. *must be kept clear.* Was

that frequency free of interference? NO! Amateurs that had never employed that frequency "moved" there and, pitiful to relate, caused QRM or interference beyond belief!

The boys in Johnstown begged and implored the stations *not* carrying traffic to "please close down," as messages, not rubber stamped affairs but calls for aid, army orders, words to a loved one, must reach the outside area! Some stations did as requested and others *did not!* Here is the point we want to bring out. Can an army be led without a commander? Can a navy maneuver without a flagship? Then how can sixty thousand amateurs proceed without a leader? If there was one, where was he? It is considered correct to offer constructive ideas when criticizing. We make the following suggestions:

Every large city or district should have a leader—call him Master, Commander, District Superintendent or what you will. He should appoint several amateurs to see that his orders are carried out. These lieutenants should have the telephone numbers of the amateurs living in that particular territory. If he has not a telephone, all amateurs should be obliged to get in communication with the lieutenant. The amateurs who are in the distressed area should then be informed that such and such a station will be on watch for his signals. The main point is that messages from the stricken area should be given first consideration at all times.

Such a thing as petty jealousy and publicity seeking does not exist in the real amateur's code of honor. Quietly he goes about his mission and when a line appears about him in a periodical it only proves that he has accomplished a worthy deed. We heard the work that the amateurs were doing and many who did wonders have as yet not had a single word devoted to them. W8KRF and W8EHR were, in our humble opinion, two shining lights in the entire and never-to-be-forgotten calamity.

There are times when we wonder if some amateurs have a decent receiver! And if they have one, do they ever listen on their own frequency? During the height of the "flood traffic" a few amateurs threw their carriers on the air, testing and causing interference. This is bad enough when

there is no need for amateur aid, but a thousand times worse when the frequencies are so sorely needed.

We sincerely hope that in the event the amateur fraternity is called upon again to render aid, they will be organized to distribute their services to the best advantages. Of course, the main trouble is that the phone bands are too crowded and should be widened!

Now to the short-wave notes. Overseas broadcasts from the Japanese short-wave stations are being carried on over JVN, 10.66 meg., and JVP, 7.51 meg., from 4 to 5 p.m., on Monday and Thursday. JVN has been an exceptionally strong signal, but JVP is erratic. Mr. S. Kuramochi, chief of the engineering department, says, "If the results are good, we intend to open a daily service at this same hour." Reports are requested and the address is: Kokusai Denwa Kaisha, Ltd., 1 Chome, Uchisaiwaicho, Kojimachiku, Tokyo, Japan.

Edward Startz, the world-known announcer of the Netherlands stations, informs us that besides the regular programs which are radiated over PHI-PCJ, every Sunday special programs will be broadcast on 9.59 meg. (PHI) from 7:30 to 8:30 a.m. and 7 to 8 p.m. PHI, on 11.73 meg., will also be on the air from 1 to 2 p.m.

"Radio Caracas" is the new name of YV2RC, 5.08 meg. The march with which "Radio Caracas" starts and closes their programs is not the Venezuelan Anthem but is the "IBC," this station's official theme song.

VP3MR, 7.08 meg., British Guiana, has a new schedule, Tuesday and Thursday 5 to 6 p.m., Saturday 5:25 to 6:45 p.m., Sunday 9 to 10 a.m. Address reports to: The Manager, Bookers Drug Store, P.O. Box 17; Georgetown, Demerara, British Guiana.

HJ1ABT, 9.60 meg., "Radiodifusora Cartagena," had been heard between 2 and 4 a.m. transmitting test programs. English announcements add to the enjoyment of this station's programs. Reports are requested. Address P.O. Box 37, Cartagena, Colombia, South America.

On 6.64 meg., HIT broadcasts excellent programs from 6 to 8:30 p.m. They identify themselves as "La Paz de RCA-Victor" and sign off with the playing of "Victory." Address P.O. Box 1105, Trijillo City, Dominican Republic.

Every Monday night from 10:30 to 11:30 p.m. HI3C, 6.90 meg., La Romana, Dominican Republic, will broadcast a special program to the members of short-wave organizations. They sign off with the playing of "Sousa's March."

HJU, Buena Ventura, Colombia, continues to be heard testing on 9.60 meg. from 6 to 7 p.m. and 9 to 10 p.m.

VPD, 13.07 meg., Suva, Fiji Islands, has been heard every night (or should we say every morning?) except Sunday, from 12:30 to 1:30 a.m.

The British Broadcasting Corporation has brought two new frequencies into service and GSN ("N" for nation), 11.82 meg., Daventry has been heard every morning from 1:15 until 3:30 a.m. with an R-8 signal. GSJ ("J" for Justice), 13.93 meg., was active during the fall months, then closed down, but is now back in the B.B.C. service and heard on transmission number 2 from 6 to 8:45 a.m.

OER2 is operating on 6.07 meg. every week-day from 9 a.m. to 5 p.m. and on Saturday until 6 p.m. with a power of 1.5 kw. This station, rarely heard in the United States, would appreciate reports. Address Osterr Radio-verkehrs, A. G. Johannesgasse, 4 B, Wien, Austria.

We have not devoted space to foreign amateurs heard here in the eastern part of the United States, but if we have sufficient requests for this material we will gladly be guided by our readers' comments.

New Receiver

(Continued from page 729)

control until the light-green area of the "eye" begins to flicker. The calibrated input scale reads in microvolts for all frequencies up to 15,000 kilocycles. For measurements on the two higher frequency amateur bands it is necessary to multiply the dial reading by ten.

Another feature that will interest the amateur is the incorporation of a crystal filter providing up to 50-cycle selectivity. The receiver itself is mounted in a crackle-finish cabinet 22 inches long, 10½ inches high and 11½ inches deep. It has six controls in addition to tuning control on the front panel. The power supply is self-contained, but the loudspeaker is external. A tabulation of the specifications of the receiver follow:

Circuit: Superheterodyne, 460 kilocycle intermediate with iron-core transformers and automatic volume control.

Tubes: Ten in all; three 6K7s as r.f. and i.f. amplifiers; two 6J7 oscillators; one 6L7 first detector; one 6H6 second detector and A.V.C.; one 6F5 first audio; one 6F6 audio output; one 6E5 tuning and signal strength indicator; one 5Z4 rectifier.

Dial: Calibrated in megacycles with amateur bands indicated; it incorporates mechanical band-spread with two vernier scale providing three digit logging of stations.

Controls: Combined power, tone control and stand-by switch; calibrated signal-input control; selectivity (crystal phasing) control; A.V.C. on-off switch; tuning dial; range or band switch; audio gain control, beat oscillator on-off switch; calibrated heterodyne control.

Speaker: Eight-inch dynamic, semi-mounted. Audio output is 4½ watts.

The incorporation of the 5-meter band in a receiver of this type undoubtedly will herald a new era in ultra-high-frequency operation. Of course, with 460 kc. intermediate, tuning at 56 megacycles will be much sharper than with the broad-tuning type super-regenerative sets now commonly used. Therefore, when signals with frequency modulation are received, some distortion will result. However, signals that are free from frequency modulation will be heard as clearly as those on the lower frequencies. With the trend toward master-oscillator power-amplifier (m.o.p.a.) and crystal-controlled transmitters on 5 meters, selective receivers of the general coverage type undoubtedly will find wide application. With receivers of this type in use it should encourage amateurs on this band to stabilize their transmitters. At the same time this will make more room on this band (which already is 4000 kilocycles wide—the widest available to the amateur for 'phone operation).

Vibration Pick-up

(Continued from page 733)

yet high sensitivity is attained. The rated output is approximately ¼ volt for 1/1000 of an inch of movement at 250 cycles per second.

The frequency range is from 10 to 3000 cycles, and is substantially square law in form, as shown in Figure 1. Motions recurrent in character may be shown visually on a cathode ray oscillograph for study and analysis.

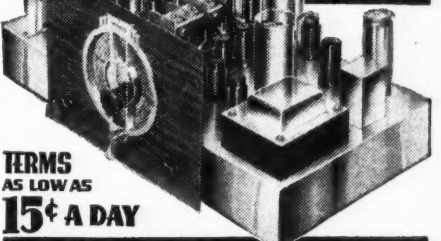
Since the end of the mounting cone is tapped, a prod may be easily attached. When so used the unit is held in the hand and the prod pressed firmly against the vibrating member. However, since the unit is light (it weighs but 8 ounces) it may be clamped directly even to light parts without changing the amplitude and frequency of vibration—the most convenient and satisfactory method of use.

This device should be of considerable value to servicemen as well as for use in physical, mechanical and sound laboratories. From the data it presents, greater efficiency, quieter operation and longer life of machinery should be obtainable. In building construction, improved sound insulation should result, reducing nerve strain and increasing the efficiency of workers.

Again..MIDWEST STARTLES THE RADIO WORLD

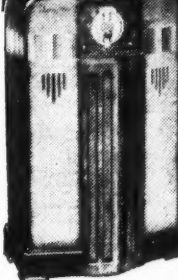
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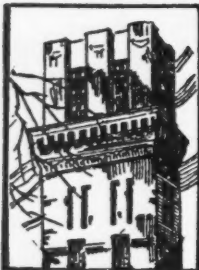
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4440 Elston Ave. Chicago, Ill.

The DX Corner

(Short Waves)

(Continued from page 757)

10:30 p.m., E.S.T. (Foshay, Law, Immicke.)

HP5K, Colon, Panama, 6005 kc., 49.96 meters, reported heard 7:30-9 a.m., 12 noon-1 p.m. and 6-9 p.m., E.S.T. (Foshay, Lawton, Marmon, Church.)

HP5J, Panama City, Panama, 9590 kc., reported heard 12 noon-8 p.m., E.S.T. (Lopez, Coover, Bissell.)

SOUTH AMERICA

VP3MR, Georgetown, British Guiana, 7074 kc., reported heard, except Sunday, 4:30 to 8 p.m., E.S.T., and on Sundays 7:30 to 9 p.m. (Meehan, N. C. Smith.)

VP3BG, Georgetown, British Guiana, 7200 kc., reported heard during evenings and on Sundays until 8 p.m., E.S.T. (Shea, Wickham.) This station also is heard on the amateur 14-megacycle band at the low-frequency end.

HJU, Buena Ventura, Colombia, 9500 kc., 1000 watts, reported heard 12 noon to 2 p.m. and 8 to 11 p.m., E.S.T., on Wednesdays and Fridays. (Danforth, Wilkinson, Graham, Kentzel, Moore, Williams, Pilgrim, Frost, Davis, Behr, Howald, Gavin, Fletcher, Cox, Jensen, Stabler, Atkinson.) Observer Richardson says he heard them 5 to 8 p.m., E.S.T.

HJN, Bogota, Colombia, 5970 kc., reported heard 8 to 11 p.m., E.S.T. (Amos.)

HJB, Bogota, Colombia, reported heard on 14,950 kc. calling New York at 2 p.m. (Hynek.)

HJ1ABJ, Santa Marta, Colombia, reported heard on 6006 kc., 1 to 2 a.m. (Loke, Morman.)

HJ1ABC, Cucuta, Colombia, 9600 kc., 31.25 meters, reported heard 2 to 11 p.m., E.S.T., announcing in English and Spanish. (Sahlbach.)

HJ1ABP, Cartagena, Colombia, 9600 kc., reported on the air 7:30 p.m. to 11 p.m., E.S.T. (Rodriguez, Danforth, Fritsch, Bower, Anca, Moore, Jensen, Pilgrim, Lopez, Holt, Cox, Davis, Amos, Betances, Gavin, Butcher.) Some Observers reported this station as HJ1ABB, HJ1ABE, and HJ1ABC.

HJ3ABD, Bogota, Colombia, is reported now transmitting on about 6065 kc. and heard as late as 12 midnight. (Foshay.)

HJ3ABF, Bogota, Colombia, 48.5 meters, reported heard as late as 11:35 p.m., E.S.T. (Costes.)

HJ3ABH is reported as changing frequency to 6375 kc. (Moore.)

HJ3ABI, Bogota, Colombia, is reported now to be transmitting on 6070 kc., approximately, and heard 8 to 10 p.m., E.S.T. (Smith.)

HJ4ABD, Medellin, Colombia, 5770 kc., reported heard at 9 p.m., E.S.T. (Rodriguez.)

HJ4ABC, Ibague, Colombia, 6451 kc., reported daily evenings 8 to 10, E.S.T. (Foshay, Anca.) Observer Wynand says the frequency is 6457 kc.

La Voz de Pereira, 6070 kc., reported heard 9:30 to 11 a.m., 6:30 to 9:30 p.m. (Foshay, Moore.) This is a station that many Observers still report at HJ4ABC.

HJ4ABE, Medellin, Colombia, 5930 kc., reported heard 6 to 10 p.m. (Amos, Adams, Howald, Shea.)

HJ5ABC, in Colombia, 6145 kc., reported heard 7:30 to 8:30 p.m., E.S.T. (Moore.)

YV4RC, Caracas, Venezuela, 6375 kc., 47 meters, reported daily except Sundays 6 to 10 p.m., E.S.T. (Wilkinson.)

YV9RC, El Valle, Venezuela, 6400 kc., reported heard 9:50 p.m., E.S.T. (Rodriguez.)

LSX, Montegrande, Argentina, 10,350 kc., reported heard irregularly around 8 p.m., E.S.T. (Pickering, Dressler.)

LRX, Buenos Aires, Argentina, 9580 kc., reported heard irregularly evenings around 9:30 to 11 p.m., E.S.T. (Hynek.)

LRU, Buenos Aires, Argentina, 15,290 kc., reported heard with test programs 5:30 to 6:30 p.m. and also 8 to 9 p.m., E.S.T. (Chambers, Adams, Gallagher, Hull, Bower.)

CEB, Antofagasta, Chile, 10,230 kc., reported heard signing off at 6:15 p.m., E.S.T. (Rodriguez.)

CEC, Santiago, Chile, 9545 kc., reported heard 7:15 to 8 p.m. (Herz.)

CB960, Santiago, Chile, 9600 kc., reported heard until 11:15 p.m., E.S.T. (Pilgrim.)

HCJB, Quito, Ecuador, has again changed frequency to 8590 kc. and is heard daily 1:30 to 4:30 a.m., E.S.T., according to Observer Gaiser.

OCEANIA

VK3LR, Lyndhurst, Australia, 9580 kc., reported heard 12 midnight to 1 a.m. and 5 to 7 a.m., E.S.T. (Howald, Frost, Parsons, Gallagher, Stabler.)

VK3ME, Melbourne, Australia, 9590 kc. (some listeners say 9490 kc.), reported heard from 4:15 a.m., E.S.T., on daily. (Ludewig, Howald, J. Frost, Parsons, Rodriguez, W. E. Frost, Bissell, Sahlbach.)

VK2ME, Sydney, Australia, 9590 kc., 31.28 meters, reported heard 5 to 9 a.m., E.S.T. (Sands, Ludewig, Gallagher, Wolf, Howald, N. C. Smith.)

ZLT, Wellington, New Zealand, 11,000 kc., reported heard testing 12:30 to 4 a.m., E.S.T. (Hull.)

VPD, Suva, Fiji Islands, 13,070 kc., reported heard 12:30 to 1:30 a.m., E.S.T. (Gaiser, Shea, Akins, Chambers, Gallagher, Moore, Reilly, Howald.)

KBI, Manila, Philippine Islands, 21,140 kc., reported heard testing with music on Sundays 4 to 6 p.m., E.S.T. (Hull.)

KKVP, Honolulu, Hawaii, reported heard on about 16,050 kc., 12 midnight to 2 a.m., E.S.T. (Markuson.)

KTO, Manila, Philippine Islands, reported heard on about 16,200 kc., 12 midnight to 1 a.m., E.S.T. (Markuson.)

Readers Who Are Awarded "Honorable Mention" for Their Work in Connection with This Month's Short-Wave Report

W. J. Thomas III, Dr. Max Hausdorff, N. C. Smith, F. G. Carmichael, L. M. Jensen, F. T. Reilly, R. C. Messer, E. L. Frost, James E. Moore Jr., R. C. Ludewig, Edward DeLaet, A. Belanger, Joe Stokes, Frank Andrews, Arthur Church, Kenneth Dressler, Oliver Amle, Eddie C. Zarn, Harry Wolf, J. T. Atkinson, H. Kemp, R. O. Lamb, G. L. Harris, Thomas Worden, D.R.D. Wadia, L. Stabler, William Koehnlein, George C. Akins, Jack Bews, Fred Cox, Donald Bissell, Charles Holt, Lewis Miller, Bruce Holmgren, Alvin H. Behr, Wade Chambers, Arthur B. Coover, S. A. Tucker, George Danforth, Sidney G. Millen, Harold F. Lower, Leo Herz, Roy L. Christoph, Dan C. Morgan, A. F. Dittmann, L. E. Williams, C. W. Bourne, Thomas P. Jordan, Clayton D. Sands, M. J. Markuson, J. F. Fritsch, Harry E. Kentzel, Thaddeus L. Grabek, Frank Wheeler, Robert Homsher, Eric Butcher, M. Michaelson, Raymond S. Swenson, L. C.

McCormick, J. Lunn, Eric W. Watson, Charles E. Pellatt, James Lynch, Richard H. Graham, Caleb Wilkinson, Joseph Trzuskowski, Donald Smith, L. W. Leroi, Frank C. Barrett, Richard Suratt Jr., Dwight Williamson, Albert Pickering, Jenner Bastien, G. C. Gallagher, Jose L. Lopez, Jerry M. Hynck, R. W. Sahlbach, E. W. Law, Isaac T. Davis, Robert Barnes, Charles Parcels, Morgan Foshay, Jose Rodriguez R., Harold J. Self, Randolph Neal, Boris Scheierman, Ted Stark, Fred A. Pilgrim, Enrico Scala Jr., Victor D. Seright, E.M.O. Godee, D. Thwaites, Harold W. Bower, F. M. Parmeter, R. S. Houghton, Melton and Gilpin Amos, A. J. Hull Jr., Robert F. Gaiser, Augusto Anca, Manuel E. Betances, H. Westman, J. Wendell Partner, Vincent S. Cigoj, George H. Fletcher, Clarence Norman, Malcomb L. Gavin, Werner Howald, C. H. Wesser, Walter F. Johnson, Laurent Gagnon, D. W. Parsons, Frank Sakely, George James Ellsworth, Stanley E. Armsby, A. Monaghan, W. H. Capell, Frank Nosworthy, I. Queen, Johan P. Curiel, R. Lawton, R. Bern, J. Y. Pa, Lawrence E. Grant, H. E. Rebensdorf, A. S. Mather, Robert Roger, N. M. Pettis, Flavio C. Mascarenhas, J. S. Phillips, C. W. Twomey, Stanley J. Zuchora, Howard Adams Jr., John Monckton, Leinard Trickle, W. E. Frost, Fred C. Lowe Jr., George Munz, Earle R. Wickham, H. F. Drake, A. T. Hull Jr., B. L. Cummins, Jose D. Caro Costas Jr., H. Francis Shea, James Brown, P. C. Richardson, Anton J. Cindel, Chester A. Joeger, Luis Diez A., J. L. Marcum, Arthur Immicke, Irving G. Couvillion, W. J. Humphries, Bernard Shoneborger, Ron Gurr, Garland Haas, Morton Dennis Meehan, H. W. Kamen, George L. Loke, Jack Frost, V. W. Slaughter, Douglas S. Catchim, R. C. Owen, Bernard L. Wood, Manno Nelson Jr.

The DX Corner (Broadcast Band)

(Continued from page 741)

January 8th. CMCB, 1230 kc., 150 watts, Havana, sends out a nice letter of verification. This station's address is: Happy Joe Sabritos, Radio Chain, Bacardi Building, 305, Havana, Cuba.

Observer Kimmons (Austin, Texas): The "R.N. Trap Circuit Tenatuner" was constructed the first week of this month and words can not express how much this tuner boosts the signals. 100-watt stations in Vermont and Maine were heard that I have been trying for 4 years to get. I would not be afraid to bet that at least 75 new stations would have been logged if this tuner had been used since the beginning of the present season. Summer static is already very bad here in Texas.

Observer Phillips (Cambridge, England): Have had another good month of listening. Radio Ile de France has shifted from 1348 kc. to 1360 kc. where it has a clear channel. Radio Beizers, a Paris station, is going to move into the center of France. EAJ15, 3 kw. (to be increased to 4.5 kw.) is now operating on 1020 kc. along with Barcelona. Hamburg now has a fanfare of trumpets to announce the opening of programs, the reveille of the German navy being played. Bremen gives a few bars of an old folk song for the opening. The private station at Salonica which closed in 1934 is again on the air on 1285 kc. from 17:00-20:00 GMT weekdays, and from 11:30-13:00 GMT Sundays. Reports to this station should be addressed: Association des Sansfilistes Saloniciens, 37 rue Condouriotis, Salonica, Greece. A new station in Czechoslovakia using 30 kw. on 392 kc. will open some time in May. A French program heard on 731 kc. at 13:30 GMT should not be mistaken for Marseilles PTT as this program comes from Seville, Spain. From 23:30 to 00:30 in winter and from 22:30 to 23:30 GMT in summer Radio Toulouse will give Arabian and other oriental music. This can also be heard from Radio Maroc, 601 kc.

Observer Mathie (Hawkes Bay, N. Z.): The TP's mentioned by Observer Shields (Ohio) in the DX Corner, January issue, Radio News, as being unidentified on 640, 670, 790, 870 and 1020 kc. would be 5CK, 2CO, 4YA, 2GB and 2KY respectively. FFZ, 1400 kc., Shanghai, China, states that they are using 1 kw. and broadcast daily as follows: 4:30-6 GMT, popular program; 10:30-12 GMT, popular program; 12-13 GMT, course of French and Chinese studies; 13-15 GMT, classical program. The address is Radio Station FFZ, Administration Municipale, 135 Route Frelupt, Shanghai, China.

Service Contest

(Continued from page 747)

"The writer will be glad to furnish additional data to anyone sufficient interested to drop him a line." (Suggest enclosing a self-addressed and stamped envelope.—Editor.)

FOURTH PRIZE

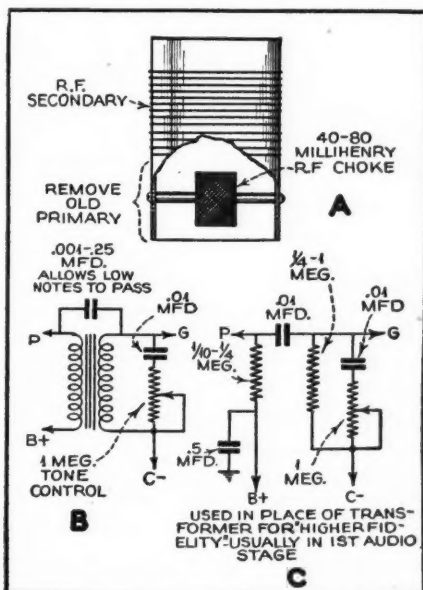
H. E. Becker sells electrical appliances as a side-line. Concerning the service bench illustrated in Figure 4, he writes: "The foundation of this bench is a davenport frame, which I was about to discard when the idea struck me. Legs and a top completed the conversion. Remove eight bolts, and the legs are off—for convenient transportation. The panel is of mahogany varnished pressed wood. The bench top is of the same but heavier material. This bench is amply provided with all useful meters, different ranges being secured with convenient selector switches. All a.c. and d.c. voltages associated with radio receiver operation are available. The equipment consists of an all-wave oscillator, tube tester and Universal push-button analyzer. The shelf is on casters, and is used mostly for sets awaiting service or delivery. Additional shelf room, not shown in the photo, provides orderly space for spare parts, tubes, etc.

"I have a front room in the house with a private entrance and a sliding door to the living room. Lotsa fun! I am a telegraph operator, and this is my side-line and hobby." (This davenport idea is a good one—but we know several servicemen who would take it as an invitation to lie down on the job.—Editor.)

Radio Workshop

(Continued from page 739)

drawing "A." Next I connect a small bypass condenser having a capacity from .001 to .25 mfd. from the plate to grid terminal of the audio-frequency transformers. See diagram "B." This provides a path for the lower frequencies which are usually cut off in the earlier model sets. The proper capacity of the bypass condensers must be determined by experimenting. Third, I add a tone control, usually a 1 megohm potentiometer and a .01 condenser combination connected across the secondary of the output a.f. transformer.

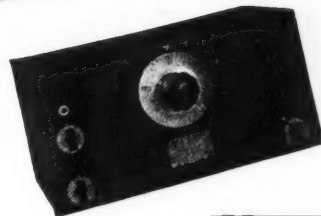


Sometimes I install new tapped dual-band r.f. coils and if the set is very powerful, I substitute for the first a.f. transformer a resistance-coupled stage as in diagram "C".

Sets revamped in this way have plenty of pep without any loss in selectivity and the tone is much improved.

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Although these omissions do not greatly restrict its usefulness, they make it possible to price the HRO Junior at a very attractive figure.

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Gentlemen: Please send me your descriptive folder on the Standard HRO and the HRO Junior.

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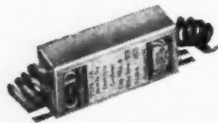
New! Service over 5,000 sets with only 30 condensers!

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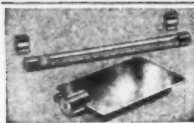
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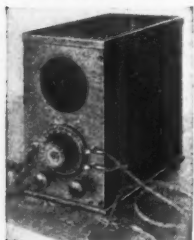
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DX Hints

(Continued from page 753)

metal surfaces to be joined should be scraped or filed to a clean, uniform brightness. Fasten firmly together. For best results and permanency add all three finishing touches—solder, tape and paint.

An outdoor aerial should be at right angles to a nearby power line, railway or the like. Aerial wire is better if stranded and enameled. If a shielded lead-in is employed, the shielding must be well grounded.

Suppose you fear or suspect that your aerial is too long for the station tuned in, or the receiver in use, but do not wish to do a job of roof-climbing after midnight. Here is a quick way to decrease the aerial's effective length; put a 100 mmfd. fixed condenser in series with your lead-in wire.

Inspection should be made from time to time of the outdoor portions of your aerial system. Insulation is all-important. Remember that even the wet wood of a roof or house wall forms a partial conductor, eager to steal those vital microvolts from the incoming signal.

Give all tube-prongs a light sandpaper cleaning several times per year. Keep variable condenser plates free of dust—applying the same care to exposed resistor surfaces and similar gear.

Such minor attentions may appear insignificant, taken separately. Adopted collectively, they may reward you with the long-awaited logging of Shanghai or Africa.

The non-technical broadcast listener is often apt to forget that headphones sometimes will bring in a weak DX signal where in some cases loudspeaker reception might be unsatisfactory. If your receiver has no phone jack, a suitable adapter can be made or purchased.

For the utmost success in DX dialing, it is not enough to "tune slowly," always. Rather, you must move the condenser control over one (or one-half) point on the dial scale, leaving it motionless there for a half minute or longer, depending on air conditions. Fading, atmospheric and the like may completely blank out a faint signal, which may come in with fair strength after a short wait.

The various DX Clubs are a real help to the enthusiastic nighthawk listener. They provide, generally at nominal cost, a valuable exchange of hard-to-get information—tips, station changes, schedules, special DX programmes, and perhaps best of all, the sporting spirit of competition which makes one try to acquire a better log than the other fellow.

By all means, consult the Short-Wave Time-Table in this magazine for your "regular" short-wave listening-in. It will save you time and insure you getting real results out of your receiver! Also consult the listeners' reports in The DX Corner to see if you can better the records other listeners are making.

It is trite to say, keep a log. But it makes a fine reference.

Anyone with an all-wave set is missing an opportunity for a lot of pleasure and satisfaction if they do not try a twist at the fascinating high frequencies—a plunge into the earth-girdling short waves. Looking around me it seems that everyone and his auntie are doing it. Here one can recapture the thrills of early days in radio—multiplied tenfold!

To such as may be hesitating on the brink of this plunge, the advice of a confirmed addict will invariably be, "Go ahead—you'll never regret it!" To get the full mixture of joy, exasperation and surprises from the game, start off by building a small short-wave receiver for yourself. Every schoolboy nowadays has the necessary diagram for just the best circuit very clearly in his mind, right where the algebra should be!

You may by some miracle get by without once mastering a jigsaw puzzle and face posterity with a certain assumed air of calmness. But never will you be able to look your grandchildren in the optics if you failed, during the nineteen-thirties, to throw together a two or three-tube blooper, and (with the aid of the plumber, the postman and Miss Nextdoor) drag in "Rah-de-oh Rom-ah" by brute force and some ear-stretching.

Take this tip (or reject it) as one dabbler's opinion based on experience: the average converter does not give as pleasing results as a decidedly haywire, home-carved straight short-waver. (Using an equal number of tubes.)

It is generally admitted that converters are temperamental. However, when a converter is properly designed and constructed, it is good!

Perhaps the author is a bit prejudiced against the converter, due to certain memories attending his own unforgettable launching into the short waves via that route. Including the fun (?) of building the necessary filament transformer, of which the combined weight and dimensions tended to over-balance a large brick home. Not that the transformer gave trouble. It was instead one small, unsuspected but guilty fixed condenser lurking in that first mysterious kit of radio parts. At that dim date your consultant did not know how to test such a gadget, so (confession is good for the soul, if not for the record)

the traitorous "triple-0-5" sent the receiver volume control to glory by way of the cremation pathway. Let it pass, though, like the condenser did the plate voltage.

Later the converter showed a marked partiality for the code songs of NAA, five assorted North American 'phones, a lesser group of hamfones, plus WOO, WQN and XDA. One winter evening it hopped the big pond to the tight little isle, and proudly strutted back with GSA replete with words and music. Neither of us has so far recovered from that surprise!

A general working rule for short-wave radio reception, as regards the best time of day for the various bands, would be: below 30 meters during daylight, and above that wavelength at night. The "World Short-Wave Time-Table" revised monthly in Radio News, will provide specific information on when to listen for each station.

There is little point in trying to tell anyone just how sharp the tuning is on short-wave reception, as it is one of those facts capable of being grasped properly only by personal experience. However, if the newcomer to the high-frequency channels, after building or buying the first receiver, can control or at least faintly moderate his eagerness to bring Australia "pounding in" till after the first evenings tuning . . . there is a gradual means of approach to the full realization of this extremely sharp tuning.

Also, listen in on 20, 80 and 160 meters for the Amateur Stations and see what a "kick" you can get out of their conversations. You may think at first that these "Ham" voices are talking English; then a few moments later begin to question your rash assumption—because of much that you will hear, it may seem as if the boys are making sport of the alphabet, with a pronounced liking for the letter Q.

The translation of a few of their short abbreviation forms follows:

yl—young lady
R9—very loud
sk—end of message
om—old man
xmitter—transmitter
qsl—verification
sked—schedule
qrm—interference
qrt—stop sending
Aussie—Australian
ham
cans—headphones
lid—poor operator
ow—old woman
Zedder—N. Zealand
ham

cq—general call
hi—laughter
cw—code (continuous wave)
xyl—wife
qra—address
shack—radio room
qrl—busy
qrn—static
grx—stand by
bcl—broadcast listener
cul—see you later
op—operator
qso—2-way communication
73—best regards
88—love and kisses

Instead of saying "sk" (end of transmission), friend ham may throw it into a vocal imitation of the code characters for those two letters (..—) thus: dit dit dit dah dit dah. Or if he is in a more exuberant frame of mind and oral output, his rendering of sk may be something like "diddly bump de bump." In like manner "hi" (laughter) becomes dit-dit-dit, dit-dit.

Incidentally, if the broadcast fan is in a rush to put the new short-waver into operation, this may be managed without the expense and delay of erecting a second aerial. To the short-wave receiver antenna terminal attach a length of hook-up wire, long enough to reach the lead-in of the long-wave receiver's aerial. Twist a short length of the short wire several times around the lead-in. Do NOT make a metal-to-metal contact of any sort between the two wires. This is known as a capacity coupling.

Later, a separate short-wave aerial system may be used, since directional experiments often lead to surprisingly helpful results.

You are now prepared to forsake sleep, society and sordid business for the serious (though hilarious) job of accomplishing the all-wave fanatic's ambition.

23-Tube Receiver

(Continued from page 713)

From the standpoint of the broadcast band DX fan the tests at the Bronx listening post demonstrated that this receiver offers a really remarkable degree of selectivity. For instance, it was possible a good deal of the time to tune in the Cuban station understandably on 715 kc. while WOR, the strongest local station, was going full blast on 710 kc. In numerous other instances,

stations operating on "split" frequencies were tuned in, but this case was especially noteworthy because of the tremendous signal received from WOR.

Before leaving the subject of broadcast band reception it is interesting to note that Edward Goss, one of the Radio News Official Broadcast Band Listening Post Observers, located in Brooklyn, New York City, has attained the "World-Wide" degree offered by the International DX'ers Alliance with a duplicate of the receiver used in these tests. To qualify for this degree it is necessary to tune in and verify 540-1500 kc. broadcast reception from all continents of the world. R. H. Tomlinson, another Official Observer located at Portchester, New York, who has been operating one of these receivers during the winter has likewise heard and verified reception from an amazing number of transatlantic and transpacific broadcast stations.

On the short waves the receiver certainly shines for its ability to pull in distance and produces strong signals with a minimum amount of noise. As an indication of this ability we are listing below a number of 20-meter amateur phone stations heard during the last two days before this article was written. In Cuba: CO6OM, CO8YB, CO2HY, CO2SB, CO9GC (all heard better than R9); in Costa Rica: TI2AV, TI2RC, TI3AV (all better than R8). Stations NY2AE and HP1A, Panama, heard regularly (R9). HI5X, in the Dominican Republic, was heard R9+. In Mexico: KE2AH, XE3AG, XE1G, XE2FC, XE2AH, XE3G were all heard above R8. CE1BY, believed to be in Chile, was received R5 to R7 with some fading. In Canada: VE1DR, VE3EO, VE3UR, VE4DU, VE4FI, VF4MB, VE5BK, VE5HI, VE5HN, VE5OT (all R8 to 9). K6JLV, in Hawaii, was heard Saturday night at 3 a.m. (R8+). In the afternoon of the same day the following English amateur phone stations were heard R5 to R9+: G6LK, G5ML, G6QS, G5JO. During these same two days the following Australian amateurs were heard on phone: VK2UC, VK2AC, VK2NY, VK2NH, VK2NO, VK2OD, VK2EW, VK3AP, VK3QS (R5 to R9). It will be noted that we have not included any of the American amateurs as even the 6's and 7's were too numerous to record here. Also remember that this was only two days' reception and we note, looking at the past logs, hearing amateurs on phone from every continent and from over fifty different countries.

In order to show world coverage of short-wave stations from the New York area on this receiver, an examination was made of the logs of both the Westchester and Bronx listening posts. The list that follows gives only those stations that were positively identified during the two-months' period. There were hundreds of other stations logged but either due to difficulties of language or possibly due to the fact that a large number of them were special transmissions their location and identity were not confirmed so we are not listing them here.

Kc.	Call Letters	City, Country
21540	W8XK	Pittsburgh, Pa.
21530	GSJ	Daventry, England
21520	W2XE	New York, N. Y.
17790	GSJ	Daventry, England
17780	W3XAL	Bound Brook, N. J.
17760	DJE	Zeesen, Germany
15370	HAS3	Budapest, Hungary
15340	DJR	Zeesen, Germany
15330	W2XAD	Schenectady, N. Y.
15290	LRU	Buenos Aires, Argentina
15280	DJO	Zeesen, Germany
15270	W2XE	New York, N. Y.
15260	GSJ	Daventry, England
15244	FYA	Pontoise, France
15220	PJC	Huizen, Holland
15210	W8XK	Pittsburgh, Pa.
15200	DJB	Zeesen, Germany
15180	GSO	Daventry, England
14150	GSF	Daventry, England
15110	DJL	Zeesen, Germany
15041	RKI	Moscow, U. S. S. R.
14600	JVH	Nazaki, Japan
13635	SPW	Warsaw, Poland
13200	ORP	Ruysselede, Belgium
13075	VPD	Suva, Fiji Islands
12235	TFJ	Reykjavik, Iceland
12000	RV59 (RNE)	Moscow, U. S. S. R.
11900	CT1GO	Paredo, Portugal
11880	FYA	Pontoise, France
11870	W8XK	Pittsburgh, Pa.
11860	GSE	Daventry, England
11830	W3XE	New York, N. Y.
11830	W9XAA	Chicago, Ill.
11820	GSN	Daventry, England
11810	I2RO	Rome, Italy
11795	DJO	Zeesen, Germany
11770	DJD	Zeesen, Germany
11750	GSD	Daventry, England
11730	PHI	Huizen, Holland
11730	CJRX	Winnipeg, Canada
11720	FYA	Pontoise, France
11720	HJ4ABA	Medellin, Colombia
10740	JVM	Nazaki, Japan
10670	CEC	Santiago, Chile
10660	JVN	Nazaki, Japan
10260	PMN	Bandoeng, Java
10042	DZB	Zeesen, Germany
9860	EAQ	Madrid, Spain
9660	CT1AA	Lisbon, Portugal
9635	I2RO	Rome, Italy
9595	HH3W	Port-au-Prince, Haiti
9595	HLB	Geneva, Switzerland
9590	W3XAU	Philadelphia, Pa.
9590	VK2ME	Sydney, Australia

Kc.	Call Letters	City, Country
9590	PCJ	Huizen, Holland
9590	HP5J	Panama City, Panama
9580	VK3LR	Lyndhurst, Australia
9580	GSC	Daventry, England
9570	W1XK	Millis, Mass.
9560	DJA	Zeesen, Germany
9540	DJN	Zeesen, Germany
9530	W2XAF	Schenectady, N. Y.
9510	GSB	Daventry, England
9500	HJU	Buenaventura, Colombia
9490	VK3ME	Melbourne, Australia
9428	COCH	Havana, Cuba
8775	HCB	Quito, Ecuador
8750	ZCK (zbw)	Hongkong, China
7854	HC2JSB	Guayaquil, Ecuador
7797	HBP	Geneva, Switzerland
7281	HJ1ABD	Cartagena, Colombia
7118	HB9B	Basle, Switzerland
7080	VP3MR	Georgetown, Brit. Guiana
6900	HJ3C	La Romana, D. R.
6796	HIH	San Pedro, D. R.
6750	JVT	Nazaki, Japan
6710	TIEP	San Jose, Costa Rica
6667	HC2RL	Guayaquil, Ecuador
6616	PRADO	Rio Bamba, Ecuador
6611	RV72	Moscow, U.S.S.R.
6550	TIRCC	San Jose, Costa Rica
6520	VV6RV	Valencia, Venezuela
6490	HJ5ABD	Cali, Colombia
6482	HI4D	Trujillo, D. R.
6451	HJ4ABC	Ibague, Colombia
6447	HJ1ABB	Barranquilla, Colombia
6383	HI3U	Santiago, D. R.
6375	VV4RC	Caracas, Venezuela
6350	HRT1	San Pedro Sula, D. R.
6315	HIZ	Trujillo, D. R.
6300	VV12RM	Maracay, Venezuela
6225	OAX4G	Lima, Peru
6188	HI1ABH	Cienaga, Colombia
6180	HI1A	Santiago, D. R.
6160	HJ3ABF	Bogota, Colombia
6150	CJRO	Winnipeg, Canada
6150	VV3RC	Caracas, Venezuela
6132	HJ5ABC	Cali, Colombia
6130	ZGE	Kuala Lumpur, F. M. S.
6120	COCD	Havana, Cuba
6116	W2XE	New York, N. Y.
6110	HJ1ABE	Cartagena, Colombia
6110	CHNX	Halifax, Nova Scotia
6100	GSL	Daventry, England
6100	W3XAL	Bound Brook, N. J.
6090	W9XF	Chicago, Ill.
6083	CRCX	Toronto, Canada
6080	VQ7LO	Nairobi, Kenya
6080	HP5F	Colon, Panama
6079	W9XAA	Chicago, Ill.
6072	DJN	Zeesen, Germany
6072	OER2	Vienna, Austria
6070	HI2S	Port-au-Prince, Haiti
6060	W8XAL	Cincinnati, Ohio
6060	W3XAU	Philadelphia, Pa.
6060	OXV	Skamlebaek, Denmark
6050	GSA	Daventry, England
6045	HJ3ABI	Bogota, Colombia
6042	HJ1ABG	Barranquilla, Colombia
6040	YDA	Batavia, Java
6040	W1XAL	Boston, Mass.
6030	HP5B	Panama City, Panama
6020	DJC	Zeesen, Germany
6018	ZHI	Singapore, S. Settlements
6012	HJ3ABH	Bogota, Colombia
6010	COCO	Havana, Cuba
6006	HJ1ABJ	Santa Marta, Colombia
6000	RV59	Moscow, U. S. S. R.
5980	HIX	Trujillo, D. R.
5976	HJ2ABC	Cucuta, Colombia
5950	HJN	Bogota, Colombia
5930	HJ4ABE	Medellin, Colombia
5880	VV8RB	Barquisimeto, Venezuela
5875	HRN	Tegucigalpa, Honduras
5850	VV5RMO	Maracaibo, Venezuela
5800	VV2RC	Caracas, Venezuela
5780	OAX4D	Lima, Peru
5720	VV10RSC	San Cristobal, Venezuela
4273	RV15	Khabarovsk, U. S. S. R.

Hearing Aid

(Continued from page 735)

the microphone cable must be maintained. If the bare shielding braid of this cable comes in contact with the chassis, the amplifier will motorboat.

An 8-mfd. dry electrolytic condenser, C8, is shown at one of the 79 plate load resistor ends. This was necessary to overcome oscillation. It may be slipped into the space under the power transformer at the right-hand front of the chassis.

Make an additional shield for the 79 tube and its No. 1 triode filter circuit (which is located above the chassis) of 1/16-inch sheet iron, 6½ inches by 12 inches, formed into a rectangular tube 2½ inches by 3¼ inches by 6½ inches long and soldered at the lap. This is held in place around the 79 tube by strapping to the chassis at the bottom. It can also be soldered to the chassis at the bottom corner for added rigidity. A notch must be filed in the bottom of this shield to allow the microphone cable to pass through to the 79 grid. This shield is necessary to avoid hum pick-up from the 80 rectifier, which is very close.

Next, a Yaxley two-circuit rotary switch (SW2) is placed on the opposite side of the tuning condenser from the power transformer. Leads are soldered to the end of the voice coil connecting wire at the output transformer and

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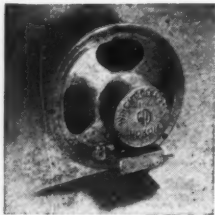
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to the terminal on the transformer, and the leads are brought down and soldered to one circuit of this two-circuit switch so the loudspeaker will operate when this side of the switch is closed. The other side of the switch is wired in series with the lead from the 79 tube output to the 42 grid. Thus, when the loudspeaker is in operation, the hearing aid is off, and vice versa. This avoids the squeal which would occur if both the the loudspeaker and the hearing aid were on at the same time.

The hearing aid should now operate satisfactorily. No hum should be audible with the earpiece volume control half-way advanced, at which point acoustic feedback is likely to start unless the earpiece is pressed against the ear. The user should take a position ten or more feet from the set for best results when using the maximum power as a hearing aid.

Holes are drilled in the radio cabinet front for the two switches, at about the height of the tuning knob and in a position to bring the right-hand switch between the tuning condenser and the power transformer. The left-hand switch should be set over far enough to avoid the tuning condenser. Two inches from the tuning condenser shaft is about right for the right-hand switch and three inches for the left-hand switch.

Cut a hole in the left-hand end of the cabinet at the front for the phone jack—it can be mounted in place with 6-32 screws and nuts.

The earpiece used is a Trimm Featherweight of 1000 ohms or higher resistance. The Trimm miniature, also, is very good where hearing loss is not too great. If the miniature is used, it should be 2000 ohms resistance and should be used with a hard-rubber, individually-molded earpiece to get the proper fit for the ear and maximum benefit. The headphone volume control is in the headphone cord as a matter of convenience.

Such a device as this should not be accessible to children and should be used with caution at all times. The user should turn the volume down at the earpiece control when close to the microphone, before manipulating the switches, while dialing the telephone or while he is removing and replacing the telephone receiver. This is to avoid excessively loud sound such as might occur during these operations, due to the high amplification. When the user has formed the habit of retarding the volume on approaching and adjusting the set, this is not hard to avoid. It should be made a point that no one except the individual who is hard of hearing is to use the earpiece and that no one else is to attempt to manipulate the switches or tune the radio while such individual is using the earpiece. To protect the earpiece from unnecessary abuse, always turn the volume control off when it is not in use.

The changes we have made in this radio should not have affected the radio itself except for a slight reduction of loudspeaker volume. This reduction of volume is so slight that it is negligible. If a large reduction has occurred, the radio should be checked over and re-balanced. It will be found that the two-circuit switch for loudspeaker-hearing aid change-over has in reality three positions. The third position is midway between; and in this position the loudspeaker and hearing aid are both off, the radio music going to the headphone only. This makes it possible to eliminate the 79 tube filament switch and substitute a tone control in its place, if desired.

Parts List

- One Philco receiver, model 84-B
- One Astatic Microphone Co. crystal microphone
- One Trimm Featherweight headphone (1000 ohms d.c. resistance or more)
- C1—Tubular by-pass condenser, .5 mfd., 400 volts
- C2—Tubular dry electrolytic condenser, 10 mfd., 30 volts
- CC3, C4, C5—Tubular by-pass condensers, .25 mfd., 400 volts
- C6, C7—Tubular by-pass condensers, .05 mfd., 400 volts
- C8—Cardboard-case, dry-electrolytic condenser, 8 mfd., 500 volts
- C9—Tubular dry electrolytic condenser, 25 mfd., 30 volts
- R1—Centralab "Modu Plug" volume control, potentiometer type, 20,000 ohms (with 20 ft. cord)
- R2—Two 5-watt resistors in series, 50,000 and 250 ohms
- R3—Metallized resistor, 5 megohms
- R4, R5, R6, R7—Metallized resistors, 50,000 ohms, ½ watt
- R8, R9, R10—Metallized resistors, .25 megohm, ½ watt
- SW1—H. & H. rotary snap switch, s.p.s.t.
- SW2—Yaxley two-circuit rotary switch
- One type 79 tube
- One 6-prong wafer type socket with tube shield
- One special shield (see text)
- One Gilbert alarm clock case
- One Auburn Rubber Co. fruit jar opened (for microphone mounting)
- Two small knobs
- One bakelite ring, ½ inch thick, 2¼-inch hole, 3¾-inch outside diameter
- One sponge rubber, ½ inch thick by 3¾-inch diameter
- One twin phone jack
- Miscellaneous hardware
- Cost approximately \$60, complete at list prices

The Radio Beginner

(Continued from page 737)

several reasons why the above described method of operation (Figure 2) is not popular for small sets. In the first place it requires an extra "C" battery and it is necessary to know the exact location of the sharpest point of the bend for a given plate voltage, so as to get most efficient detection.

A second system which does not require a "C" battery is more practical for a simple receiver. This makes use of a grid condenser and a grid leak. The circuit is shown in Figure 5. The grid-leak resistor, R2, is connected to the positive side of the filament, making the grid slightly positive and as a result a considerable plate current will flow when no signal is coming in. When the grid is driven more positive by a signal (the positive half of a cycle), electrons will be attracted by the grid itself and will charge the grid-condenser C3, the grid side of it becoming negative. During the next half-cycle (negative) no electrons can be attracted and the grid cannot get rid of its charge except through the grid leak R2. This takes a relatively long time and while a current is flowing through the resistor, there is a voltage drop across it making the grid negative except at the peak of the positive half cycle. In this way the bias adjusts itself to a point where detection takes place.

Proper proportioning of the grid condenser and grid leak are necessary, so the charge will leak off at the required rate. Suppose, for instance, that the grid resistor has a very high value, it will take very long before the charge leaks off and during that time, the grid may stay so far negative that the tube is inoperative. On the other hand, if the resistance is too small there may not be enough bias and the tube will be insensitive.

This circuit is used in the revised receiver presented this month and makes the signals much louder. For detection purposes a rather low plate voltage ("B" battery) will be satisfactory. It works well with only 22.5 volts. Since a standard 45-volt "B" battery is required for use with units to be described in future articles of this series, the parts list shows such a battery rather than the 22.5-volt type. There is, of course, no objection to using a smaller capacity battery with 22.5 volts maximum for this month's receiver.

The complete circuit of the new unit is shown in Figure 5.

Changing the old circuit to the new one is simple. The connections to the coil and the tap switches remain the same; nearly all changes are made at the tube socket. First mount another Fahnestock clip at the right-hand back corner of the baseboard. This will become the B+ terminal. Disconnect and remove the leads to the phone jacks and to the plate and grid of the tube.

There is a wire which runs from the filament switch to tap 3 or 4 of the coil. Disconnect this wire from the coil and connect it to the ground wire. This connects the negative side of the filament to ground.

Connect the B+ Fahnestock clip to the nearest phone clip. The other phone clip is connected to the plate terminal of the socket. The grid condenser, C3, is connected from the stationary plates of the tuning condenser (one of the outside terminals) to the grid terminal of the tube socket. Then connect the grid leak, R2, from the grid terminal to the positive filament terminal. That's all.

When hooking up the set, note the correct polarity of the batteries and connect them as shown in Figure 5.

The parts list for last month's diode-detector receiver is repeated below. The additional parts required for this month's change are listed separately.

- C1—Aerovox mica condenser type 1467, .00025 mfd.
- C2—Hammarlund "Star" midget variable condenser, 140 mmfd.
- R1—15 ohm filament resistor.
- SW1, SW2—Yaxley one-gang 11 point switches, non-shorting, type 1211
- SW3—S.P.S.T. toggle switch.
- Bud 2¾-inch dial.
- Bakelite coil form, 2½ inches in diameter, 4 inches in length.
- Magnet wire, ¼ lb., number 24, double silk covered.
- 6 Fahnestock clips, 1 inch overall
- 2 small angle brackets (for mounting the coil).
- 1 baseboard, wood, 6 inches by 9 inches, ½-inch thick.
- 1 panel, wood, 10 inches by 6 inches, ¼-inch thick.
- 1 pair of Acme headphones, 2000 ohms.
- 1 Eby base-mounting socket, 4 prong.
- 2 Burgess "Little Six" dry cells.
- 1 type 30 tube.
- Additional parts list for change over to triode detection:
- C3—Aerovox, type 1467 mica condenser, .0001 mfd.
- R2—IRC carbon resistor, 2 megohms.
- 1 Fahnestock clip
- 1 Burgess standard 45-volt B-battery, tapped at 22½ volts.

Selling Service

(Continued from page 733)

from all at once. Put punch into your "copy". The desired force can usually be given by just the addition of a simple cartoon or photograph. Remember the old Chinese proverb, "One picture is worth a thousand words". Just cover over the illustration in each of the direct-mail pieces illustrated in this article. Notice how "flat" the plain printed message looks without the illustration.

Make your message a "personal" one. Experience and tests definitely show that the "personalized" advertising pieces—messages straight from the writer to the reader—are the ones that produce results. Tell your prospects about your shop, your services, about Y-O-U!

Try to make your direct-mail piece different by putting in that little indefinable "twist" that will put it over. Tie in your message with important local, national, or international events if possible. In the spring, tie in with the housewife's urge for a thorough clean-up and going-over of everything in the house. Offer a 6-point inspection service for her radio set. In the fall, tie in with football game and election broadcasts. Forthcoming broadcasts of boxing contests, international events, operatic concerts, etc., can all be used as interest-getting reasons for having sets repaired and tubes replaced.

Make sure that your literature is a clean-cut tidy job and that it is not overcrowded in appearance and is easy to read. Many campaigns make or break very often on their neatness, their tidy appearance—or their lack of it. If you use postcards, rotate the color of the stock used in each mailing.

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If you do use manufacturers' folders or postcards, be sure that your personal imprinting is well done—a rubber stamp is false economy—have it printed!

Make up your prospect list carefully and intelligently by selecting from a hand-picked list of actual, potential prospects—those who should be buying your services, and are in a financial position to pay, if they do buy. Nothing kills a direct-mail campaign quite as effectively as a poor list of prospects. Remember that mailing to a small selected list "often" is better than mailing to a larger list picked at random, "seldom". One very valuable part of your mailing list will naturally consist of your past customers—both recent and old.

Try to get your present customers to cooperate by giving you the names of their friends. You may also consult city and county governmental records, city directories, telephone directories, lists of church, club or lodge members,

employee lists of local plants or firms, exchange of lists with local non-competing businesses, social notes or news items in local newspapers, club publications, local movie theatre mailing lists, etc. A complete catalog and price list of City, County and State Directories and Gazetteers published in North America may be obtained on application to the Association of North American Directory Publishers, 524-528 Broadway, New York City.

A guessing contest in your window (or local theatre) requiring all contestants to fill in their names, addresses and information about their radio sets, will give you an excellent list. Likewise a local "radio noise and interference" survey. Take pains to build up a good list, and when you get it, keep it on cards or on stencil plates—and keep it up to date. If you are in a position to make large mailings fairly frequently, consider the purchase of a postcard printing and addressing machine (such as the Cardvertiser put out by the Elliott Addressing Machine Co. of Cambridge, Mass., or the Addressograph-Multigraph Machines of the Addressograph-Multigraph Corp. of Cleveland, Ohio).

Do not fail to check the accuracy of names and addresses before using a new list. Your local postmaster will correct your local mailing list twice a year, for 1 cent per name, plus postage for the return of the list. Print the standard "Return Postage Guaranteed" over your name and address in the upper left hand corner of the postcard or envelope. Then you will be able to eliminate from your list all those names to which mail is undeliverable.

Addressing of the postcards or envelopes may be done by hand in ink, with a typewriter, or by an addressing machine. The former is somewhat more personal, but it should be done by a person who has a good legible handwriting. Addressing is worth approximately \$2.00 per 1000 names. Incorrect spelling of names, or the incorrect use of Mr., Mrs., and Miss, causes resentment and lessens the possibility of favorable reception, interest and action.

You can obtain all the important and current postal regulations briefed and indexed in a small 20-page handy reference booklet by sending 10 cents in stamps or coin to the Direct Mail Advertising Association, Hotel Pennsylvania, New York City.—*Alfred A. Ghivardi, author Modern Radio Servicing, T. S. Ruggles, specialist in direct mail advertising.*

Radio-Nations

(Continued from page 712)

Enquiry on the Sino-Japanese conflict. At this time and also during the Bolivia and Paraguay disputes, nearly all the telegrams were handled by Radio-Nations.

The Secretariat of the League of Nations has used the Radio-Nations station for short-wave overseas broadcast service, intended for the public of these overseas countries, which is often little or ill-informed of the League's activity. This broadcast service, for which the Information Section of the Secretariat is responsible, with the technical cooperation of the Transit Section and which was placed under the supervision of a special broadcasting committee, was inaugurated on September 25th, 1932, by Sir Eric Drummond, at that time Secretary-General. Broadcasts have taken place regularly once a week, on Saturdays, from 5:30 to 6:15 p.m., E.S.T., in English, French and Spanish, on wavelengths of 31.3 meters and 38.47 meters. Lately other waves have been added. These broadcasts generally take the form of bulletins on the current work of the League of Nations, prepared by the Information Section of the Secretariat. From time to time, distinguished men who happen to meet at Geneva in connection with the League meetings are requested to speak before the microphone of Radio-Nations. Mr. Henderson, President of the Disarmament Conference; Lord Lytton, Chairman of the Commission of Enquiry in Manchuria; M. del Vayo, Chairman of the Chaco Commission; M. de Valera, M. Politis, Mr. Wilson, Mr. May and many others have been heard on these broadcasts. This service has met with considerable success. In eighteen months, the Information Section has received 17,000 letters from listeners all over the world. Relays of the most important transmissions have been made frequently in Dublin, Sydney, New York, Buenos Aires, Rio de Janeiro and Toulouse.

The broadcasting service of the Information Section has replied and is replying regularly to all the letters and postcards received from listeners. It endeavours by this correspondence, and by sending publications, the text of talks, to arouse an increasing interest in the League of Nations in its hearers. As regards the development of the service, the Information Section has studied the problem inter alia in the light of suggestions and advice given by listeners themselves in response to an inquiry undertaken by radio, and in the light of the remarks made by several "analysts" and commentators of the chief American and European wireless stations who have studied the organization of Radio-Nations.

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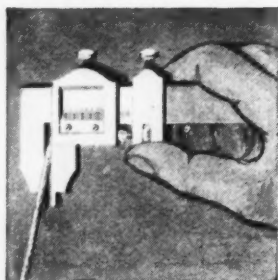
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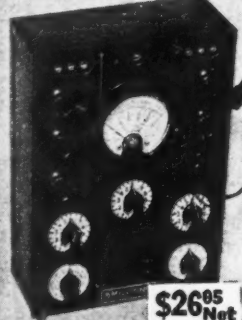
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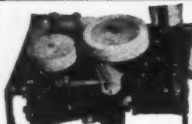


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Amateur Transmitter

(Continued from page 727)

is provided in the buffer stage. This facilitates keying in the oscillator circuit. The 46 tubes do not draw current when excitation is removed so they are ideal in a transmitter with oscillator keying. This arrangement of tubes and bias facilitates break-in operation and does not require the use of batteries.

The next logical addition if the builder is interested in 'phone operation is the addition of the speech amplifier-modulator unit. This also has many features. One of them is the provision for use of either crystal or double button types of microphones. Individual plugs are provided for each. The power unit supplies the necessary current for a carbon microphone. And, of course, a phonograph pick up may be connected to the "crystal" plug for modulation testing. The speech amplifier-modulator is mounted in a panel and chassis similar to the r.f. unit and is designed to fit in a steel cabinet directly under the transmitter. However, each may be mounted in separate dust-proof cabinets if desired and separated from each other. It has a 96 DB gain over-all and more than 25-watts of audio power which is sufficient to modulate the r.f. unit 100 per cent. It employs a type 57 pentode connected first stage resistance-coupled to another 57 triode connected which in turn is resistance coupled to a 46 Class A driver. This drives a pair of 46s in Class B. Gain control, plate current meter and power switches are mounted on the front panel. The unit is so wired that the power plug for the r.f. unit may be connected to the modulator, which contains its own power supply, and the transmitter may be turned on and off by the plate and filament switches on the modulator.

Still later a third unit may be added to convert the two for controlled-carrier operation. This unit mounts directly under the modulator and has a switch for changing from either straight carrier to variable carrier. It contains all of the necessary equipment for this arrangement including the necessary auto-transformer and "variator." This system of controlled-carrier is simple and effective. The method, of course, is quite simple. The controlled carrier is obtained by taking advantage of the varying plate current of the Class B modulator tubes. This varying current is employed to vary the class C input in proportion to the amount of modulation power at a given instant so that regardless of volume level the modulation of the carrier is always 100 per cent.

These three units offer the amateur an all-around, medium-powered transmitter with most all of the modern innovations. All three may be mounted in a steel cabinet to lend a "commercial" appearance. And the cost is kept small by virtue of the fact that the builder does most of the costly work. The whole unit costs less than \$150.

If more power is desired the 852 unit already mentioned may be added. When using such an amplifier in conjunction with a controlled-carrier driving unit, far greater outputs may be obtained than those driven by a constant carrier. For instance, with this particular unit, the normal Class B carrier would be only about 80 watts. However, with the variable carrier the effective carrier would be in the vicinity of 200 watts. The reason, of course, is the plate load may be greatly increased on audio peaks which give the higher output, but at the same time during pauses between words or drop in level of modulation the input drops and the ratings of the tubes would not be continuously exceeded. In effect, this arrangement increases the efficiency of the Class B linear stage from average of about 30 per cent to better than 60 per cent. Even higher efficiency may be obtained with careful adjustment.

5-Meter X-Mitter Receiver

(Continued from page 730)

tained from a local lumber yard, and it is quarter-inch, hard-tempered "Masonite."

After smoothing the edges, drilling the larger holes, and cutting the 4 1/2 inch opening for the small dynamic speaker, the panel was thoroughly sanded and given three coats of gray paint. Each coat of paint was given ample time to dry and was rubbed down with oil and fine sand paper before applying the next coat. The panel is very rigid, and when finished has the appearance of gray lacquered metal.

The supporting shelf or sub-panel was also cut from quarter inch Masonite, and after cutting the holes for the wafer sockets, the sub-panel was painted gray and firmly fastened to the back of the panel with metal brackets.

The author built the described transmitter-receiver with low-cost receiving tubes and parts; most of them were resurrected from the ham station junk box. The complete circuit is shown on page 730.

2 1/2-555 METER RECEIVER

as described on page 660 of the May Radio News. We are supplying this receiver—the Haynes R-S-R—built to exact specifications by arrangement with A. J. Haynes, its designer. It is an unusually fine job, giving smooth, stable operation over its entire tremendous tuning range. Price complete with tubes, dynamic speaker and cabinet, ready to operate \$24.65. In kit form, complete with wired band-switch coil assembly, less only tubes and cabinet \$14.95.

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The microphone input transformer, for in-
stance, is an old 5 to 1 audio transformer with
the primary removed and a 500-turn winding
center tapped at 250 turns substituted.

The filter choke and modulator choke is an
old B eliminator twin 20-20 henry choke.

Care should be taken with the radio-frequency
portions of both the transmitter and receiver,
and all leads should be as short as possible. To
accomplish this, the author found it necessary
to mount the variable condensers back two
inches from the panel with bakelite shafts ex-
tending through the panel to the tuning dials.

All coils except the transmitter's grid coil
were wound with No. 12 enameled wire on a
½-inch diameter metal rod, and when removed
the coils have a slightly larger diameter due to
the springiness of the wire.

The number of turns for each coil is specified
in Figure 1, and the exact spacing of the turns
will vary slightly with the length of connecting
leads, tubes, and condensers used.

In the equipment described the turns on the
receiver coils were spaced the diameter of the
wire, and the space between the plate and grid
coils is ¾ inch. The 2-turn antenna coil is
placed in this space between the plate and grid
tuning coils.

The transmitter coils are somewhat harder
to wind, and the grid coil may require one or
two changes to place the transmitter on the spot
in the band that you desire to operate.

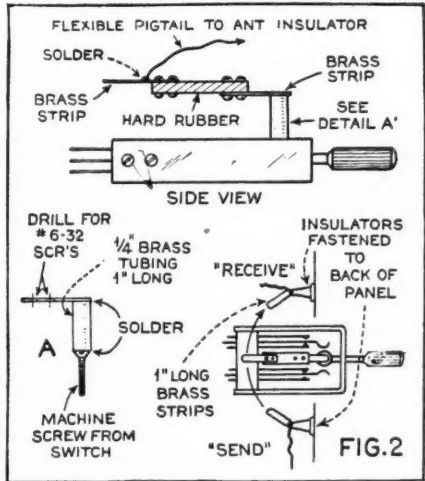
The grid coil in this case is wound with 12
turns of No. 18 annunciator (Bell) wire on a
2½-inch length of ¾-inch diameter bakelite
tubing. The turns are spaced approximately ½
inch and the tap taken off at the exact center
connects through the grid resistor and con-
denser to ground.

The plate coil is wound in the same manner as
the receiving coils but the turns are spaced ap-
proximately 3/16 inch. This plate coil is 2
inches in length and has 8-turns of No. 12 wire,
tapped at the exact center for the plate supply
connection.

The antenna coil for the transmitter may be
one 3-turn coil at least 1¼ inches in diameter
and placed around the center of plate coil, or two
coils of ¾-inch diameter and 1½ turns each,
placed one at each end of the plate coil.

The multi-contact send-receive switch is of
the common Federal telephone anti-capacity type
of 4-pole double-throw switches.

To this switch was added an insulated ex-
tension as shown in Figure 2 which adds a
single-pole double-throw, insulated antenna switch.



If good quality filter condensers are used the
mere throwing of this switch from send to re-
ceive is sufficient each time the audio amplifier
is changed from the receiver to the speech
amplifier for the transmitter. If inexpensive
filter condensers are used it is advisable to place
a small switch in the primary of the plate trans-
former to be opened just before changing the
main switch, as the plate voltage will rise suf-
ficiently in the few seconds the load is off to
endanger the filter condensers.

The antenna coils are so terminated as to
adapt this unit to any of the popular low im-
pedance fed 5-meter antenna systems.

Absolute resonance in the transmitter is ac-
complished by tuning the plate condenser and
coil to the fixed grid coil as indicated by a
minimum reading of the (0-100) milliammeter.

If the transmitter is slightly low in frequency
the turns on the grid coil should be spaced
farther apart and the condenser again turned to
resonance. If the transmitter is too high in
frequency the grid coil turns should be closer
together.

Not being satisfied with the reports of "R-9,
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we made a frequency run on the transmitter over
the speech frequencies with an audio oscillator
and cathode-ray oscilloscope to find that prac-
tically no distortion was present at 60 to 70
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tion the frequency "wobulation" was negligible.
Maurice E. Kennedy, Technical Director, KFSG.



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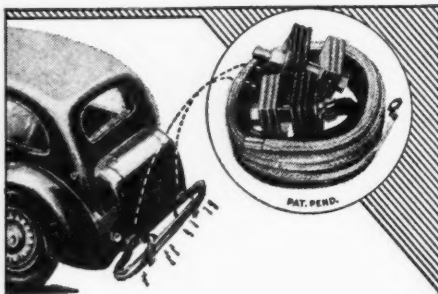
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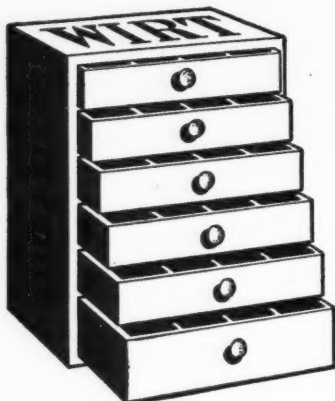
(Continued from page 755)

have been especially designed to fit Chevrolet and Ford cars, they are also applicable to many other makes.



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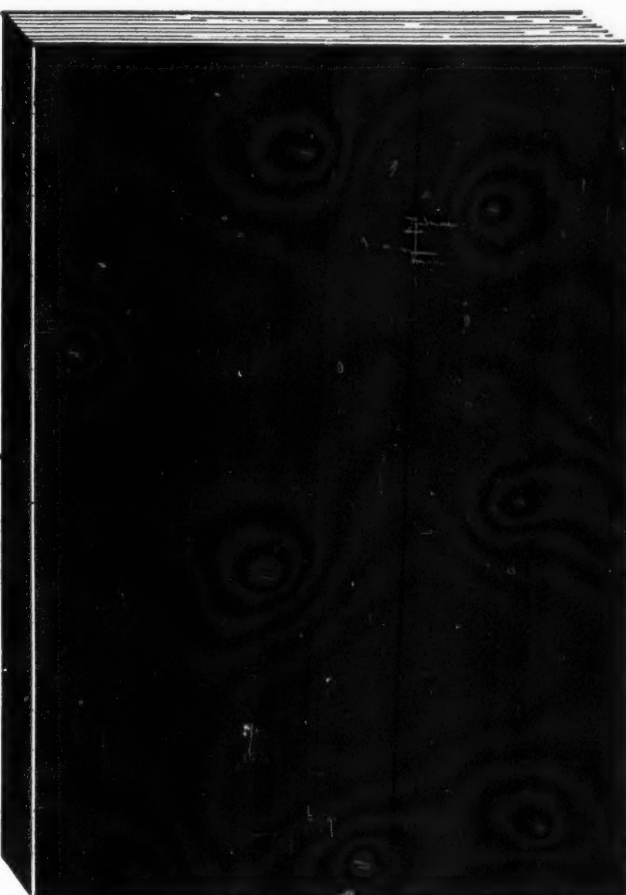
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Panel 2: HELLO, TOM, HOW'S EVERYTHING? OH, NOT SO GOOD BILL, BUT I'M STILL HAVING FUN PLAYING WITH RADIO. HADDJCLAST NIGHT ON A LITTLE SET I BUILT. IS RADIO STILL YOUR HOBBY TOO?

Panel 3: NO, TOM. I'VE BEEN TOO BUSY MAKING GOOD MONEY OUT OF RADIO TO SPEND TIME "PLAYING" WITH IT. GOSH, BILL, YOU'RE SURE LUCKY. I NOTICED YOUR SWELL CLOTHES AND SHAPPY CAR. I THOUGHT YOU HAD INHERITED A MILLION. TELL ME ABOUT IT.

Panel 4: I AM LUCKY, TOM, BUT YOU HAD THE SAME CHANCE. REMEMBER ABOUT A YEAR AGO I SHOWED YOU A BOOK FROM NATIONAL RADIO INSTITUTE THAT TOLD ABOUT THE OPPORTUNITIES AND BIG FUTURE IN RADIO, AND HOW OTHERS HAD SUCCEEDED THROUGH THEIR HOME TRAINING? REMEMBER, I TRIED TO GET YOU TO ENROLL FOR THEIR COURSE WHEN I DID.

Panel 5: WELL, IT WAS THE SMARTEST MOVE I EVER MADE. I'M DOING SWELL. MARY AND I ARE TO BE MARRIED NEXT MONTH. TOM, WHY DON'T YOU SNAP OUT OF IT? DON'T STAY IN THAT DREARY LOW PAY JOB ALL YOUR LIFE. RADIO IS MORE THAN A PLAYTHING. IT'S A BIG BUSINESS. IT'S YOUR OPPORTUNITY. TAKE MY TIP. IT ISN'T TOO LATE. RADIO IS STILL YOUNG AND GROWING.

Panel 6: IF BILL SUCCEEDED, I CAN TOO! THEN I CAN MAKE REAL MONEY SERVICING RADIO SETS OR GET A JOB IN A BROADCASTING STATION OR INSTALL AND SERVICE LOUD SPEAKER SYSTEMS OR MAKE GOOD MONEY IN ANY ONE OF THE MANY OTHER NEW AND GROWING BRANCHES OF RADIO. THERE'S NO END OF GOOD JOBS FOR A TRAINED RADIO MAN! YES, SIR, I'M GOING TO SEND FOR THAT FREE BOOK AND GET THE DOPE RIGHT NOW!

Panel 7: YOU CERTAINLY KNOW RADIO. MINE NEVER SOUNDED BETTER. THANKS! N.R.I. TRAINING CERTAINLY PAYS. I JUST STARTED A FEW MONTHS AGO AND I'M MAKING GOOD MONEY ALREADY. THIS SPARE TIME WORK IS SWELL FUN, AND SOON I'LL BE ALL SET FOR A GOOD FULL TIME JOB.

OH, TOM, IT'S WONDERFUL—TO THINK HOW FAST YOU'VE GONE AHEAD SINCE YOU WENT INTO RADIO. WE NEVER COULD HAVE GOTTEN MARRIED ON WHAT YOU WERE GETTING BEFORE.

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